THIRD FIVE-YEAR REVIEW REPORT

FOR

DISTLER FARM SITE
CITY OF WEST POINT
JEFFERSON COUNTY, KENTUCKY

September 2003

PREPARED BY

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List of Acronyms

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CGA	Coarse Grained Alluvium
COC	Contaminants of Concern
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FGA	Fine Grained Alluvium
KDEP	Kentucky Department for Environmental Protection
LTRA	Long Term Remedial Action
MCL	Maximum Contaminant Level
MSD	Metropolitan Sewer District
MW	Monitoring Well
NPL	National Priorities List
O & M	Operations and Maintenance
ppb	parts per billion
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
1,1-DCE	1,1-Dichloroethylene

EXECUTIVE SUMMARY

Remedial Action at the Distler Farm Site was initiated in September 1988, beginning with soil cleanup activities. Groundwater remediation efforts began in July 1989, and Fund-financed Long-Term Remedial Action (LTRA) was conducted at the site between December 1991 and December 2001. As part of the LTRA, contaminated groundwater was extracted and treated offsite, cleanup progress was monitored by periodic groundwater sampling and laboratory analyses, and site facilities were properly maintained In accordance with Section 104(c)(6) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the State assumed full responsibility for the Operation and Maintenance (O & M) at the site after the ten-year period of LTRA. This State function began in January 2001, and will continue until cleanup activities at the site are complete.

Two previous Five-Year Reviews preceded the current exercise. They were conducted in 1993 and 1998 respectively. Both reviews concluded that the remedy implemented at this site was progressing satisfactorily. The current review has evaluated available information and has determined that the site's remedial activities have been implemented as planned, the cleanup goals for all contaminants of concern (COCs) have been achieved, and the site appears to remain protective of human health and the environment. The State temporarily shut down the O & M system in April 2003, following favorable results of several sampling events but inspects the site monthly. Current plans are to await the results of this review and act on the basis of its recommendations.

The main recommendation in this report is that confirmatory sampling be conducted at the site over the next one year to ensure that the COCs remain below cleanup goals as has been the case for, at least, one year. The results of the confirmatory sampling should be used to determine if the O & M system should be permanently shut down and cleanup declared complete. A final closeout report should then be developed and the process for deleting the site from the NPL should be initiated by EPA.

Five-Year Review Summary Form

SITE NAME : Distler Farm
EPA ID # : KYD 980601975
SITE IDENTIFICATION
REGION: IV STATE: Kentucky CITY/COUNTY: West Point /Jefferson
SITE STATUS
NPL STATUS: Active REMEDIATION STATUS: Active
ACTIVITY IN PROGRESS: Long-Term Remedial Action
HOW MANY Ous ? 1 CONSTRUCTION COMPLETION DATE : 11/4/89
IS THE SITE IN RE-USE? No
REVIEW STATUS
LEAD AGENCY: USEPA
AUTHOR, AFFILIATION & TITLE: Femi Akindele, USEPA, Project Manager
AUTHOR, AFFILIATION & TITLE: Ken Logsdon, Kentucky Department for Environmental Protection, Project Manager
PERIOD REVIEWED: 9/98-8/2003
SITE INSPECTION DATE(S): 8/22/2003
REVIEW TYPE: Policy REVIEW NUMBER: 3
TRIGGERING ACTION & DATE: Second Five-Year Review –9/23/98
REVIEW DUE DATE IN CERCLIS : 9/23/2003
DATE REVIEW STARTED: 7/1/2003
DATE REVIEW COMPLETED: 9/22/2003

Recommendations:

1. Resume groundwater extraction and disposal and site monitoring activities which have been suspended temporarily since April 2003. Conduct quarterly sampling and analysis for one year to confirm that contaminants of concern, all of which have been below cleanup goals for at least one year, remain at acceptable levels.

2. Evaluate the confirmatory sampling results to determine if site operations should be suspended permanently and the cleanup declared complete.

3. Upon determining conclusively that the cleanup is complete, develop a work plan to shut down site operations permanently, plug and abandon all wells properly, and salvage site equipment. In addition, develop a final close-out report and initiate the process for deleting the site from the NPL.

Issues & Deficiencies: None

Other Comments: None

Protectiveness Statement:

The remedy at the Distler Farm Site continues to protect human health and the environment. Affected site soils and groundwater, including the potential for offsite migration of contaminants, have been addressed appropriately. All clean-up goals established in the decision documents for the groundwater have been met by the site as indicated by the last two rounds of groundwater sampling conducted within the last one year. Quarterly groundwater sampling in the next one year will be used to confirm that the groundwater COCs remain at levels below established clean-up goals. If so, remedial activities at the site will be considered complete.

DISTLER FARM SUPERFUND SITE
FIVE-YEAR REVIEW

I. INTRODUCTION

DISTLER FARM SUPERFUND SITE
THIRD FIVE-YEAR REVIEW

I. INTRODUCTION

The purpose of five-year reviews is to determine if the remedy at a site is protective of human health and the environment. Methods, findings, and conclusions of reviews are documented in Five-Year Review Reports. In addition, the reports identify issues found during the review, if any, and make recommendations to address them.

The Agency has prepared this five-year review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section 104 or 106, the President shall take or require such action . The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the third five-year review for the Distler Farm Site and it has been conducted as a "policy review" which the Agency conducts at a site until cleanup levels are achieved , allowing unlimited use and unrestricted exposure. Two previous five-year reviews were conducted at the site in September 1993, and September 1998 respectively. Those reviews concluded that the remedy implemented at the site was performing satisfactorily and showed that cleanup goals had been met for some but not all of the contaminants of concern. The information collected on the site over the last five years has been evaluated in this document. The evaluation indicates that cleanup goals for all COCs at the site have been met within the last one year.

This review was conducted by EPA Region 4 in August and September 2003. It was triggered by the review of September 1998.

II. SITE CHRONOLOGY

TABLE 1

CHRONOLOGY OF EVENTS

EVENT	DATE
EPA discovered and inspected site	4/77
Ohio River flooded site and scattered drums of waste in the area	12/78
Kentucky Governor sought emergency assistance from EPA on the site	12/78
EPA conducted emergency removal action at the site	1/79
Site sampling, initial private well sampling, and various site studies	1/79-7/83
Site ranked and listed on the NPL	1982
RI/FS conducted	9/83-9/85
EPA began enforcement activities	12/85
Proposed Plan public meeting held	4/86
Record of Decision signed	8/86
Remedial Design conducted	4/87-9/88
Superfund-State Contract signed	9/28/88
Soil remediation began/Remedial Construction started	9/88
Explanation of Significant Differences completed	10/88
Groundwater Remedial Action began	7/89
Remedial Action Construction completed	11/4/89
LTRA started	12/91
Interim Site Close-Out Report signed	7/8/92
First five-Year Review Report Issued	9/28/93
State-Lead-Fund-Financed Cooperative Agreement for LTRA signed	4/1/96
Second Five-Year Review report signed	9/23/98
Mandatory take-over of site O & M by State	1/1/2002

III. BACKGROUND

The Distler Farm Site is approximately 3 acres in size and is a portion of a 13.68-acre farmland in the City of West Point, Jefferson County, Kentucky. The property is bordered by U. S. Highway 60/31 W (Dixie Highway) on the northwest, Stump Gap Creek on the southeast, and by a cultivated farmland on the northeast and southwest. It is approximately one mile northeast of the Salt River and the Ohio River confluence, at 38 00' 40" north latitude and 85 55' 50" west longitude. The Site lies within the 10-year flood plain of the Stump Gap Creek.

Physical Characteristics

The Distler Farm property is mostly an open field, gently sloping northwest to southwest with scattered depressions. Surface elevations range from 425 feet to 410 feet. The property supports moderate growth of underbrush, grass and trees. It is generally wooded outside the zone of the former drum burial activities. The site is within the Salt River Drainage Basin which discharges into the Ohio River near the city of West Point. The property is frequently inundated with water during heavy rains due to poor drainage and because it lies within the 10-year flood plain of Stump Gap Creek.

Land and Resource Use

The area supports select agricultural activities, primarily small farming and grazing. Only a few residential and industrial buildings are located close to the site. The property is underlain by Quaternary-age alluvium and glacial outwash deposits of the Ohio Valley Alluvium. The later is made up of two hydrosratigraphic units, the Fine Grained Alluvium (FGA) and the Coarse Grained Alluvium (CGA). The CGA is directly below the FGA and is a laterally continuous, gravel-sand unit with a minor distribution of silt and clay. In the region as a whole, the CGA is highly saturated with water and forms a reliable source of private well water. Near the site, several residences obtained their drinking water from the CGA in the past. Most of the private wells in the area have been shut down recently due to mechanical problems and/or availability of public water supply.

History of Contamination

The site was discovered in 1977, during the development of an enforcement case against Mr. Donald Distler, owner of Kentucky Recycling Inc. He used the property for unauthorized chemical waste disposal and storage. The company apparently operated its business at this site concurrently with a similar operation at the nearby Distler Brickyard site which was leased from the owners in late 1976. The recycling operation primarily involved paint, varnish, and related waste solvents. Based on EPA's initial site inspection report, approximately 600 drums of waste were stored on the property. In December 1978, the Ohio River flooded the property and scattered hundreds of drums along the flood plain of Stump Gap Creek. USEPA and the State conducted a cleanup of the area and recovered 832 drums of chemical wastes characteristic of the paint and varnish industry. Evidently, many of the drums had been buried on-site. During the cleanup, four drum burial areas were located at the site with the aid of metal detectors which were operated by the U. S. Army Corps of Engineers.

Basis of Remedial Action

In 1979, EPA sampled private wells, surface water and sediment from the Stump Gap Creek, and soils from the site. The private wells and Stump Gap Creek samples did not indicate contamination from the site. However, samples from the drum burial areas indicated that surface and sub-surface soils, and groundwater at the site were contaminated at levels of potential risk to human health and the environment. Based on this information and several additional studies which were conducted in 1981 and 1982, EPA concluded that the site was a candidate for Superfund clean-up activities. Hence, it was ranked and placed on the National Priorities List in late 1982.

Remedial Investigation (RI) and Feasibility Studies (FS) were conducted between 1983 and 1985. The RI confirmed that soil and groundwater were contaminated and it delineated the extent of contamination. The contaminants of concern identified were: chromium, lead, toluene, 1,1,1-trichloroethane, 1,2-transdichloroethylene, trichloroethylene, vinyl chloride, bis(2-ethylhexyl)phthalate, isophorone, naphthalene, and di-n-butyl/phthalate. Based on the RI results and additional hydrogeologic studies, it was concluded that the contaminants were confined to the site at that time but that offsite migration and private well contamination were imminent. Therefore, the FS evaluated various remedial options to mitigate the potential site impact on human health and the environment. A public meeting was held on April 23, 1986, to discuss the RI/FS findings and to explain the remedies proposed for the site by USEPA in cooperation with the State.

IV. REMEDIAL ACTION

Remedy Description

On August 19,1986, a Record of Decision (ROD) was issued. It outlined the selected remedy for the site, taking into consideration comments from the public and the RI/FS results. The ROD specified the following:

1. Excavation and removal of contaminated soil to background levels; disposal of contaminated soil at a permitted hazardous waste landfill.

2. Backfilling of the excavated areas with clean dirt, grading and revegetation.

3. Extraction and temporary on-site storage of contaminated groundwater, treatment and discharge of water at a publicly owned treatment facility.

4. Operation and Maintenance.

The ROD was modified by an Explanation of Significant Differences (ESD) in 1988, based on further soil studies conducted as part of the Remedial Design. The ESD established that additional soil would be removed at the site only to the extent necessary to ensure that residual contaminants leaching from the soil would maintain certain health based Maximum Concentration Limits (MCLs) in the groundwater. These MCLs were specified in the ESD and are listed in Table 2.

Remedy Implementation

Remedial activities for the soils were conducted in late1988. Areas of contaminated soil were delineated and a series of magnetometer surveys, excavations and soil sampling followed. Contaminated soil removed from the site was disposed of at approved facilities in Rockhill, South Carolina and Atlanta, Georgia. Completion of necessary soil removal was verified by laboratory analysis which indicated that residual contaminants were below background or levels stated in the ESD. Backfilling of the excavated areas and revegetation were accomplished to complete soil remediation.

The groundwater extraction system was installed between late 1988 and early 1989. Eight extraction wells were installed and a temporary water storage tank was built. The wells and the tank were equipped with necessary pumping and automation devices. Negotiations for the disposal of the extracted water at the Metropolitan Sewer District facility were completed in August 1991, at which time a discharge permit was obtained.

EPA conducted LTRA at the site between December 1991 and December 2001 using the services of a private company (Bechtel) initially. The State began to operate the LTRA for EPA in June 1996, under a State-Lead Fund-Financed Cooperative Agreement. Groundwater was pumped and stored temporarily on-site. Periodically, water from the storage tank was trucked to and discharged at MSD's treatment facility. Operation and Maintenance (O &M) activities outlined in the Superfund State Contract for the site, including general upkeep of the remedial action facilities and site grounds, were performed as necessary. In addition, periodic water sampling and laboratory analyses as well as reporting were conducted according to the schedule established in the O & M plan. In January 2002, Kentucky assumed responsibility for the remaining cleanup activities at the site. This is in accordance with CERCLA, Section 104(c)(6) which restricts EPA to funding LTRA for no more than ten years and requires that work needed to complete a remedial action at a site after the 10-year period be the State's responsibility and designated as O & M.

Summary of Last Five-Year Review

In September 1998, the second Five-Year Review of the remedial action at this site was conducted. The review observed that chromium, lead, 2-butanone, trans1,2-dichloroethylene, 111-trichloroethane and toluene were below their cleanup goals at the site. However, arsenic, trichloroethene (TCE), benzene and 1,1-dichloroethylene (1,1-DCE) remained at unacceptable concentrations levels. Based on the information evaluated, the Five-Year Review report stated that... "Remedial Action programs at the site have been effective. Contaminated soils were removed and treated appropriately offsite. Concentrations of contaminants in on-site groundwater are within acceptable levels. In addition, sources of drinking water in the area have not been jeopardized by the site according to available data. Therefore, the remedy implemented at the site is believed to be protective of human health and the environment" The report then recommended that confirmatory sampling of the recovery and monitoring wells be conducted quarterly at the site for one year, and the results be used to determine if the LTRA should be declared complete. Finally, the report recommended that a Five-Year Review of the site be conducted in year 2003.

V. PROGRESS SINCE LAST REVIEW

The findings and recommendations of the 1998 review were discussed with the State as site operator to guide further activities at the site. Essentially, the State has operated the groundwater restoration project in accordance with the recommendations of the report over the last five years. Key monitoring and recovery wells were sampled periodically and the temporary storage tank water was sampled before discharging into the MSD facility. Laboratory analyses of the samples showed that many of the COCs consistently remained below the clean-up goals for the site. However, concentrations of arsenic, chromium, lead and benzene were observed to fluctuate and to exceed acceptable levels occasionally, based on the sampling events of 1998 through 2000. Subsequent sampling results showed that concentrations of all COCs have declined to levels below their clean-up goals within the last one year. Therefore, the State shut down the cleanup system after conducting a sampling event in April 2003, but continues to inspect the site monthly. Current plans are to await the results of this review and act on the basis of its recommendations.

In early 2001, EPA contracted with a private consulting company, North Wind Environmental, Inc. to study existing information and to recommend the next course of action for the site. Procurement of the company's services was arranged by EPA's Technology Support Center for Monitoring and Site Characterization, National Exposure Research Laboratory in Las Vegas. North Wind's study was completed in September 2002. Its report is attached as Exhibit 1. The two main findings of the study are summarized as follows.

1. Various wells were sampled to monitor the groundwater at the site since the RI was conducted in 1984 through the LTRA sampling event of October 2001. This apparent inconsistence in monitoring locations over the years resulted in incomprehensive data set. However, following the RI, monitoring was confined to the Fine-Grained Alluvium and two particular monitoring wells (MW-17 and MW-19) were consistently sampled from 1996 to 2000. These two wells provided necessary information to evaluate long term trend in the concentrations of the COCs. Due to their locations relative to the soil and groundwater contamination zones, data from these wells represented conditions in the source area (MW-17) and the down gradient groundwater contamination zone (MW-19).

2. As of October 2000, arsenic, chromium, lead, and benzene remained above MCLs. The remaining COCs at the site were below their respective MCLs.

In view of its findings, the study recommended additional monitoring at the site which would evaluate the current levels of the COCs in both the Fine Grained Alluvium and the Coarse Grained Alluvium. The recommendation included a two-year quarterly sampling of wells MW 17 and MW 19, to evaluate the FGA while MW 01 and MW 21 would evaluate the CGA. The rationales for the recommendations are that MW 17 and MW 19 would continue to monitor COC trends in the Fine Grained Alluvium while MW 01 and MW 21 would indicate whether or not contaminants have infiltrated the Coarse Grained Alluvium at unacceptable levels. Thus, if the results of the recommended sampling program indicate that no contaminants are found above MCLs in both alluviums, the RA may be declared complete.

VI. FIVE-YEAR REVIEW PROCESS

Administrative Components

The lead agency responsible for this Five-Year Review report was the USEPA. The review was conducted collaboratively by Region IV and the Commonwealth of Kentucky. The primary officials on the project were Femi Akindele and Ken Logsdon representing USEPA and Kentucky respectively.

Document and Data Review

Documents reviewed for this project primarily included the first and the second five year review reports, progress reports from Kentucky, sampling analyses reports, and the report generated by North Wind Environmental Inc. on the site in September 2002. These documents also contain the data reviewed. North Wind's report is attached as Exhibit 1. Other documents reviewed to evaluate this project included the Record of Decision, the Explanation of Significant Differences and the Work Plan for site O & M.

Kentucky's progress reports indicate that in the last five years, approximately 40,000 gallons of water were extracted from the site and discharged at the MSD facility for processing. Cost of operating the site during the period ranged from $1,500 to $2,000 per month.

A review of the design criteria for the groundwater cleanup and the Work Plan for field activities indicated that eight extraction wells, four monitoring wells and an automated water storage tank with pumping equipment are the primary site facilities for the groundwater cleanup. These facilities have performed as designed over the last five years according to the State. However, as in the past, the facilities are inoperable occasionally due to mechanical and/or electrical problems and by virtue of inclement weather, particularly flooding, snow and ice. These temporary problems have been repaired rapidly to minimize adverse effects on the project.

The number of active extraction wells at the site has varied as the groundwater restoration efforts have progressed in an attempt to optimize site operations. Only two wells, RW-4 and RW-5, have been responsible for most of the extracted groundwater from the site during the period reviewed. Others have been shut down because of low yield. Similarly, only two monitoring wells have been consistently usable for groundwater sampling during the period under review. These are MW-17 and MW-19. Others have been unserviceable due to mechanical problems or restricted flow. Performance of the RA has been monitored by periodic groundwater sampling and analyses. Concentrations of the COCs reported on the site since the last Five-Year Review was conducted in 1998 are summarized in the following Table 2. For clarity, COC clean-up goals and concentration values exceeding the goals or current MCL have been displayed boldly in the Table. In addition, current MCLs for the COCs are listed in the Table.

Table 2--- DISTLER FARM SITE WELL SAMPLING DATA JUNE 1998-APRIL 2003

Note: * means level shown is detection limit		Arsenic	Chromium	Lead	2-Butanone	Trans1,2-dichloroethylene	1,1,1-Trichloroethane	Trichloroethene	Benzene	Toluene	1,1-Dichloroethylene
Clean-up goals, ppb		**50**	**50**	**50**	**170**	**70**	**200**	**5**	**5**	**2000**	**7**
Current MCLs, ppb		**10**	**100**	**15**	**170**	**100**	**200**	**5**	**5**	**1000**	**7**
Sampling date	Well Sampled										
June 1998	MW-11	8	10*	5*	10*	5*	5*	5*	5*	5*	5*
	MW-17	5*	10*	5*	10*	5*	22	8	5*	5*	5*
	MW-19	200	60	80	10*	5*	5*	ND	12	5*	
	UDF-02	10	10*	5*	10*	5*	5*	5*	5*	5*	5*
October 1998	MW-17	24	27	10	10*	.5*	14	8	10*	10*	2
	MW-19	68	2*	2*	10*	50*	10*	10*	14	2	10*
May 1999	MW-17	4	5	4	200*	10*	10*	22.8	10*	10*	10*
	MW-19	73	1*	2*	200*	10*	10*	10*	15.2	10*	10*
August 1999	MW-17	2*	1*	2*	10*	0.5*	13.8	13	0.5*	0.5*	2.5
	MW-19	41	1*	2	10*	0.5*	0.5*	0.5*	13.5	0.7*	5*
October 2000	MW-17	61	97	87	1*	0.5*	5.64	0.5*	0.5*	0.5*	1.7
	MW-19	62	1*	2*	1*	0.5*	0.5*	0.5*	8.1	0.5*	0.5*
October 2001	MW-LH	8	-	-	1*	0.5*	0.5*	0.5*	0.5*	0.5*	0.5*
	MW-02	25	-	-	1*	0.5*	0.5*	0.5*	0.5*	0.5*	0.5*
August 2002	DF-1	5	5	2	ND	ND	ND	ND	ND	ND	ND
	DF-2	6	17	7	ND	ND	7.9	9.8	ND	ND	2.1
	DF-3	4	3	3	ND	ND	ND	1	0.8	ND	ND
	DF-4	4	6	3	ND	ND	ND	0.8	0.6	ND	ND
	DF-5	ND	26	ND	ND	ND	ND	ND	ND	ND	ND
December 2002	DF-1	ND	3	ND	ND	ND	ND	ND	ND	ND	ND
	DF-2	0.5	19	1	ND	ND	ND	ND	ND	ND	ND
	DF-3	0.7	20	0.1	ND	ND	ND	ND	ND	ND	ND
April 2003	DF-2	0.5	19	1	ND	ND	ND	ND	ND	ND	ND
	DF-3	0.7	20	0.1	ND	ND	ND	ND	ND	ND	ND

As the Table indicates, arsenic, chromium, lead, and benzene were detected at levels above acceptable levels occasionally during the reporting period but not after the sampling event of October 2001. TCE concentration also exceeded its cleanup goal sporadically until recently, or approximately August 2002. Since then, it has remained at acceptable level. Other COCs were consistently at levels below clean-up goals during the period reviewed, excluding concentrations reported as detection limits.

These monitoring data indicate that concentrations of all COCs have been reduced to acceptable levels at this site. Appendix 1 displays this observation graphically. The graphs represent the highest contaminant levels measured during each sampling period and provides the general trends for the COCs in the last five years. As stated earlier, KDEP has shut down the clean-up system temporarily, awaiting the outcome of this review. KDEP's action was based on the department's assessment of current site status which the results of this review support.

Site Inspection

Kentucky inspected the site periodically during the period reviewed and observed no abnormal conditions other than site flooding during heavy rains. USEPA and Kentucky jointly inspected the site as part of this review on August 22, 2003, and found no unusual situations or indications of adverse effect on the project.

Community Involvement Activities

In July 2003, USEPA developed a fact sheet which summarized current information about the site. The fact sheet was mailed out to update the public on clean-up activities, to announce that this Five-Year Review would be conducted, and to solicit public participation in the Five-Year Review. On August 6, 2003, the announcement was posted on EPA Region 4 website. In addition, the USEPA Community Involvement Department announced that the Five-Year Review was in progress in a local newspaper (TV Week) on September 7, 2003, and conducted a number of telephone interviews with local residents and public officials. Documents related to these community participation activities are attached as Appendix 2.

VII. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

The LTRA at this site was constructed and operated as required by the decision documents. The documents established certain clean-up goals which the remedial activities at the site have attained as discussed in this and previous five-year review reports.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

At the time the remedy selection was made, cleanup goals established for lead and toluene were 50 ppb and 2000 ppb respectively. The current maximum contaminant levels for these compounds are 15 ppb and 1000 ppb respectively, which this remedial action has achieved. In addition, the cleanup goal for arsenic was 50 ppb. EPA revised the MCL for this compound to 10 ppb effective April 24, 2003. This more stringent standard too has been met by the site. Other parameters referred to in this question are believed to remain valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

This review did not discover any other information that could call the protectiveness of the remedy to question.

Technical Assessment Summary

Based on this five-year review, the remedy at the Distler Farm Site was designed and implemented as intended by the decision documents. Performance of the cleanup activities continues to meet the remedial action objectives and/or current MCLs which adequately protect human health and the environment.

VIII. CONCLUSIONS & OBSERVATIONS

The conclusions resulting from this review are:

1. The project monitoring data evaluated for this report indicated that the cleanup goals for all COCs have been achieved.

2. No COC has been detected at an unacceptable level at the site since August 2002, when TCE which has a clean-up goal of 5 ppb, was measured at 9.8 ppb in a water sample from one recovery well.

3. The highly saturated Coarse Grained Alluvium supplying domestic water in the area has not been monitored since the RI/FS was conducted in 1985. However it communicates poorly with the Fine Grained Alluvium where most of the COCs were originally found and should not contain an unacceptable level of site contamination.

4. This review did not discover any issues of significance relative to the performance of site remedy. No conditions of potential adverse effect on the future protectiveness of the remedy were observed.

IX. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

1. Groundwater restoration at this site appears complete based on available information and clean-up goals. Therefore, it is recommended that confirmatory monitoring be conducted at the site to validate current observations. The confirmatory monitoring plan should consist of resuming groundwater extraction and sampling activities which have been suspended temporarily since April 2003. These activities should include four consecutive quarters of sampling from all serviceable extraction wells and four specific monitoring wells which include, MW-1, M-17, MW-19 and MW-21. Sampling of MW-1 and MW-21 are necessary to assess current conditions in the Coarse Grained Alluvium (CGA). The CGA is not expected to show an unacceptable level of contamination due to dilution effect and ineffective communication with the FGA. However, it has not been sampled since 1985, when the RI/FS was completed. Therefore sampling this aquifer is needed to dispel any suspicion of contaminant invasion from the FGA.

If the CGA is contaminated at an unacceptable level, then, active private wells in the area must be monitored because the CGA feeds the wells and additional clean-up activities may be necessary at the site. The additional data from MW-17 and MW-19 (FGA wells) would be used to confirm that all COCs are consistently below clean-up goals for a reasonable period of time before terminating site activities permanently.

2. Develop a work plan to shut down the LTRA system permanently. If the confirmatory monitoring data indicate that cleanup is complete, then all wells should be plugged and abandoned properly, and other site equipment appropriately salvaged. A final close out report should be prepared to document these follow-up activities and EPA should initiate the process for deleting the site from the NPL with State concurrence. If the results of the recommended sampling program are unfavorable, O & M at the site should continue as necessary.

KDEP will continue to be responsible for all site activities and the foregoing recommendations while EPA will continue to provide oversight and technical support as necessary. The follow-up actions above are to begin immediately. Thus, KDEP should commence the O & M which has been shut down temporarily since completing the sampling event of April 2003.

X. PROTECTIVENESS STATEMENT

The remedy implemented at the Distler Farm Site currently protects human health and the environment. Concentrations of the Contaminants of Concern have been reduced to acceptable levels. There are no technical or physical issues related to the site that are likely to reverse current conditions. Records reviewed indicated that remedial investigation and clean-up activities for this site up to current status were conducted diligently to eliminate all unfavorable conditions. Nevertheless, the site was previously used without permits or other controls for waste storage and recycling. Therefore, as with similar sites, future use of the property must proceed with reasonable amount of caution even after the cleanup is declared complete and any unusual conditions noted should be reported promptly to the State or EPA.

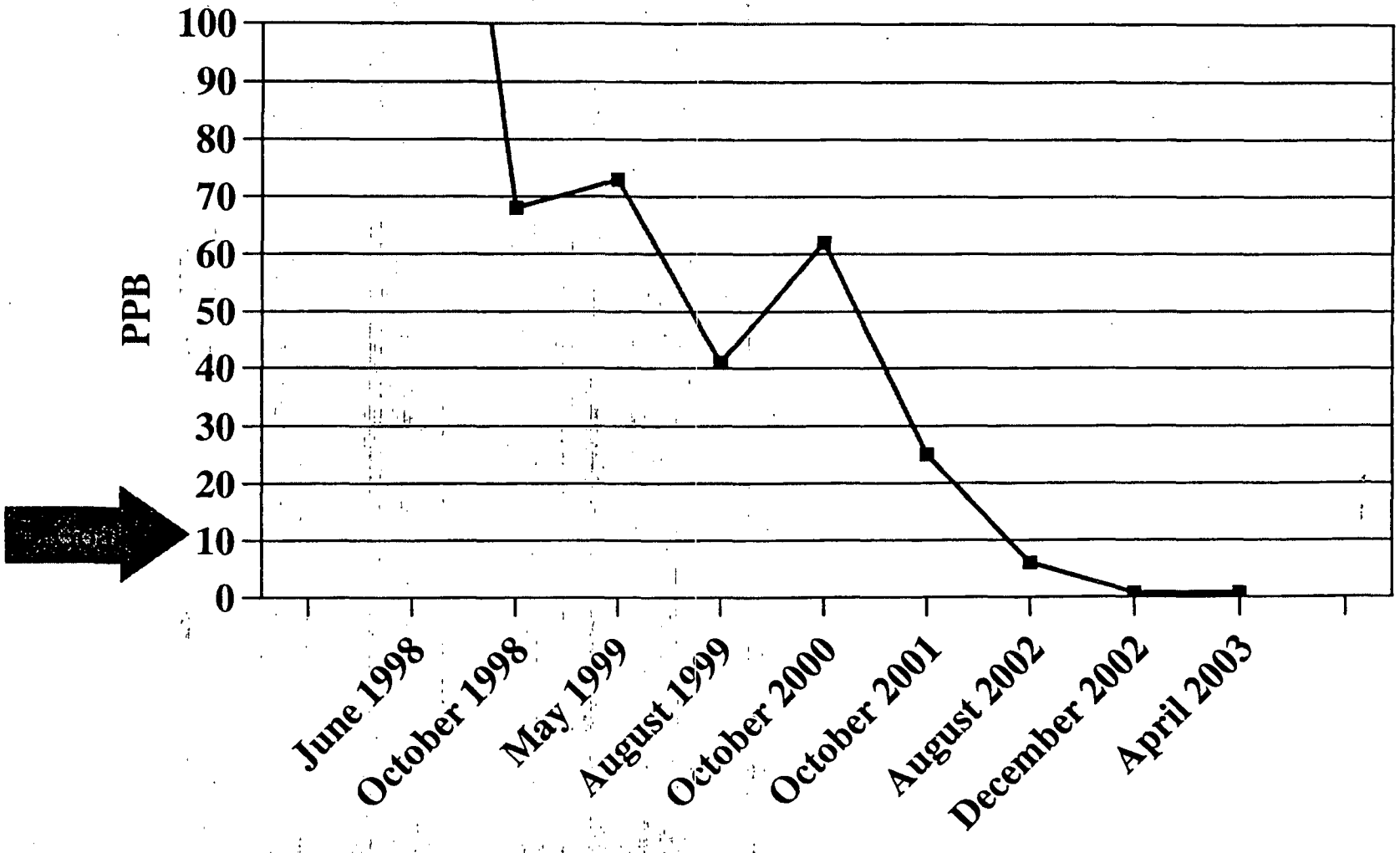
XI. NEXT REVIEW

If the confirmatory monitoring program recommended above indicates that cleanup is complete at the site, a final close-out report should be prepared to document all monitoring and site abandonment activities immediately. In that event, no further Five-Year Review is necessary for this site since current contaminant levels would not restrict the use of the site. However, if the groundwater restoration effort is to continue due to unfavorable results of the confirmatory monitoring, then the next Policy Five-Year Report will be due no later than September 2008.

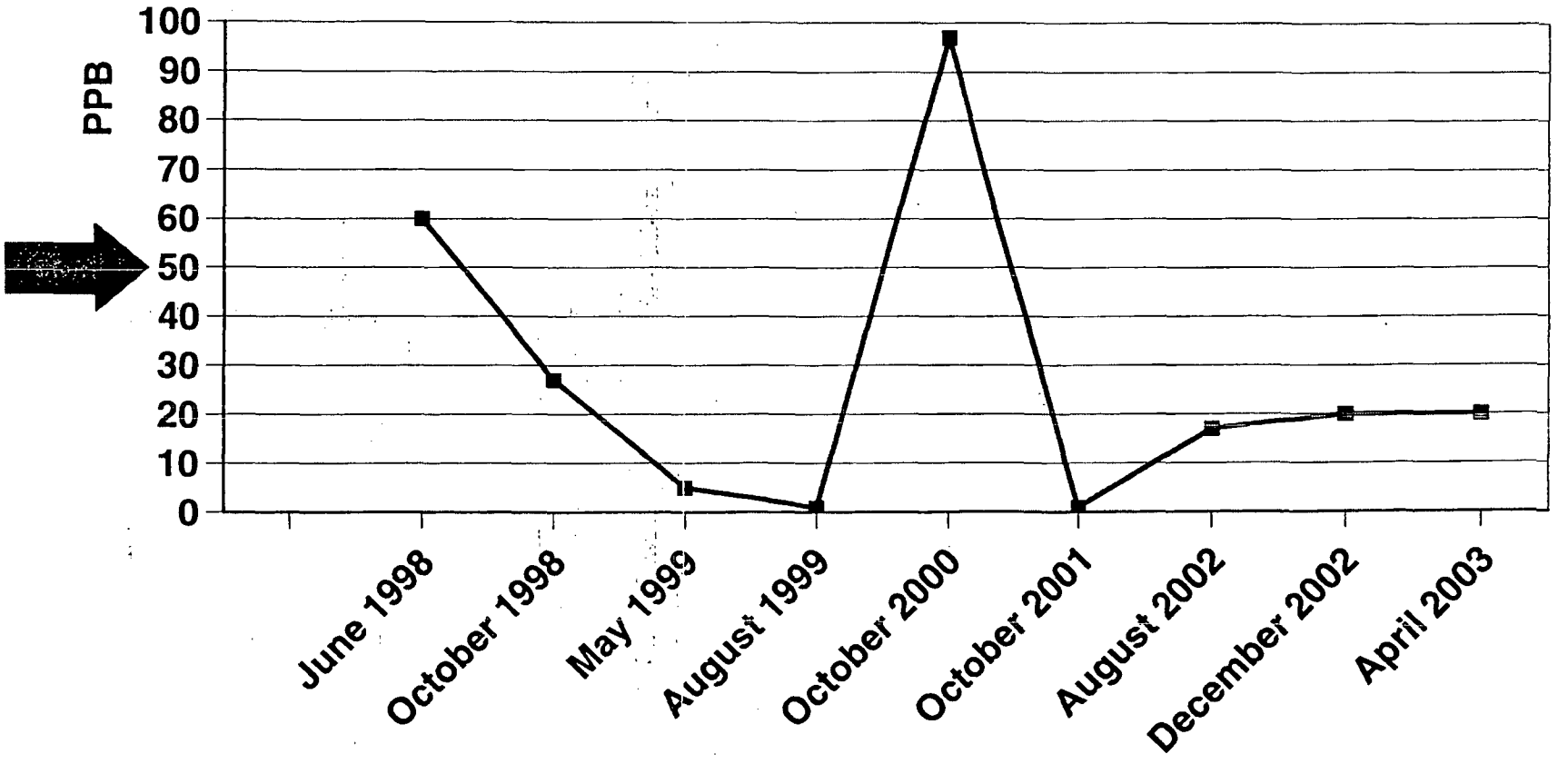
APPENDIX 1

GRAPHS OF SAMPLING DATA

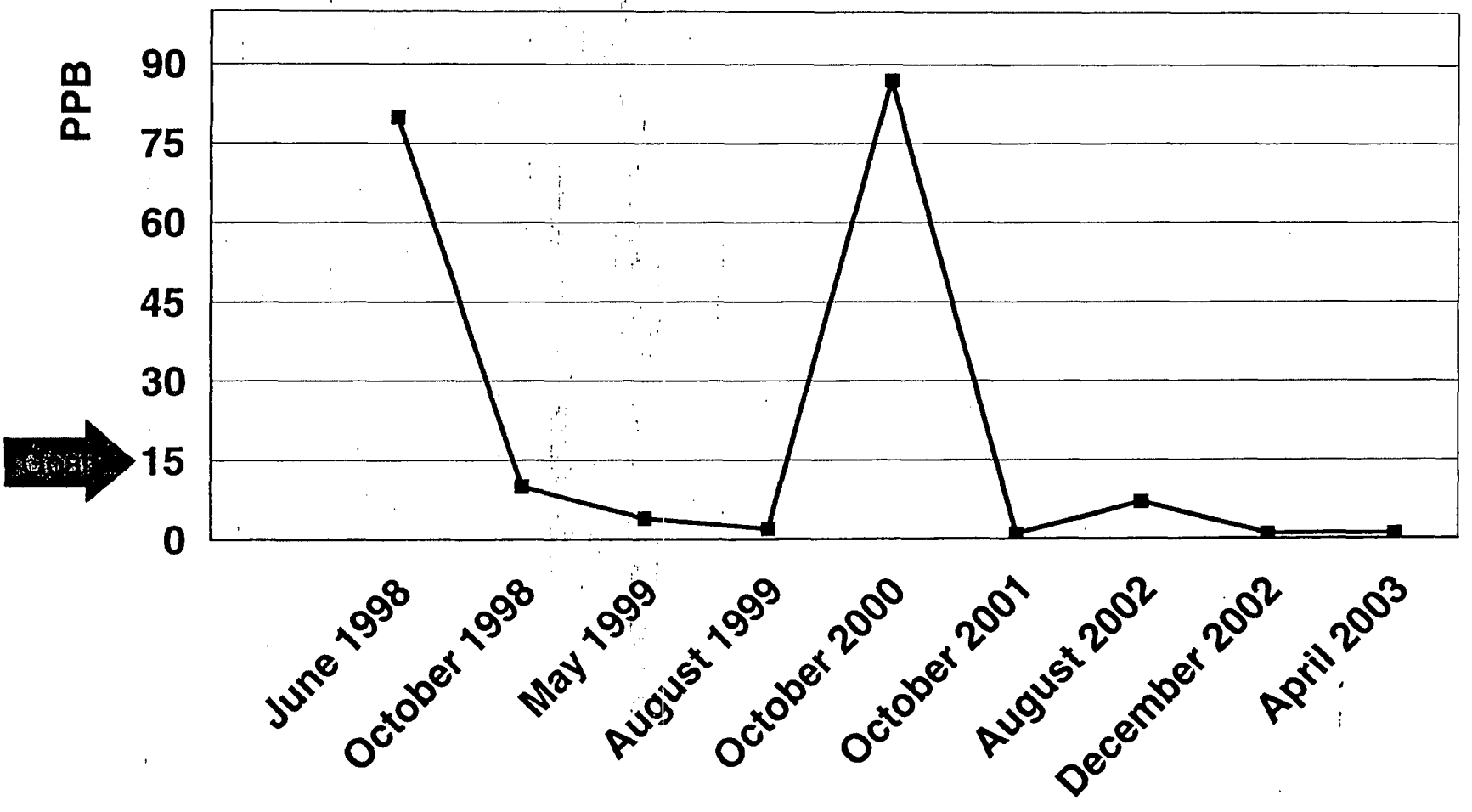
Distler Farm Site Well Sampling Data
June 1998 - April 2003
Arsenic



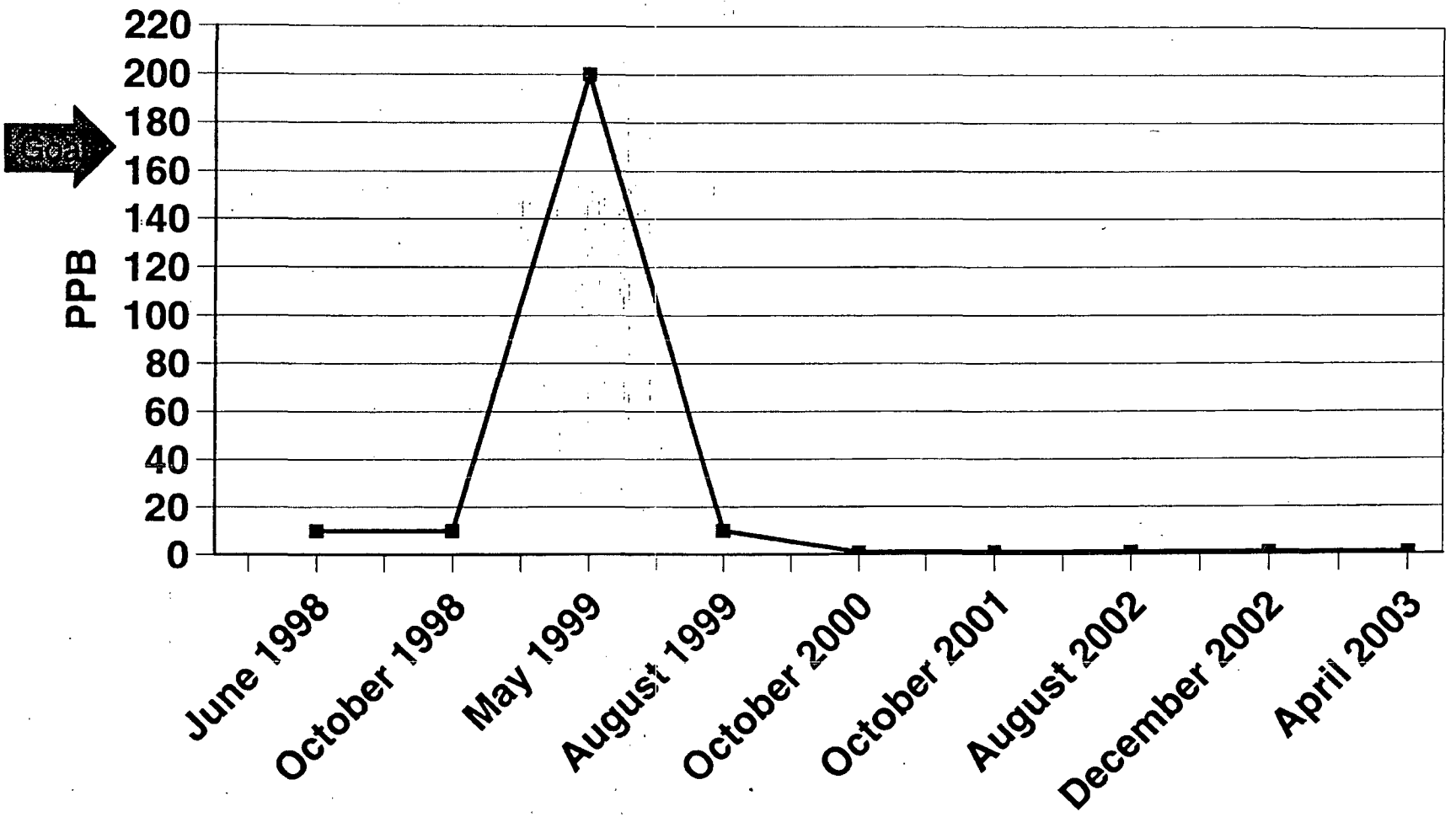
Distler Farm Site Well Sampling Data
June 1998 - April 2003
Chromium



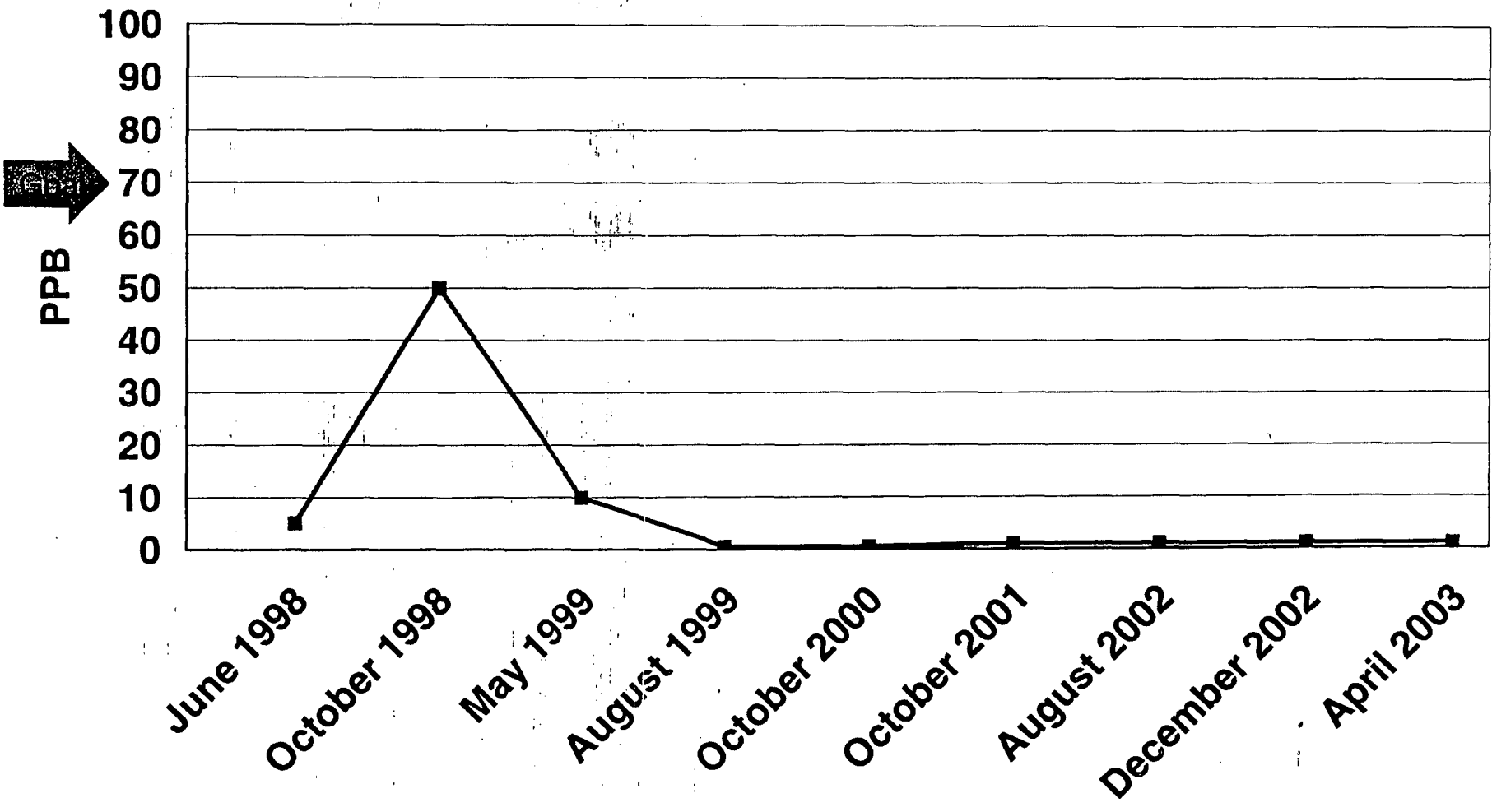
Distler Farm Site Well Sampling Data
June 1998 - April 2003
Lead



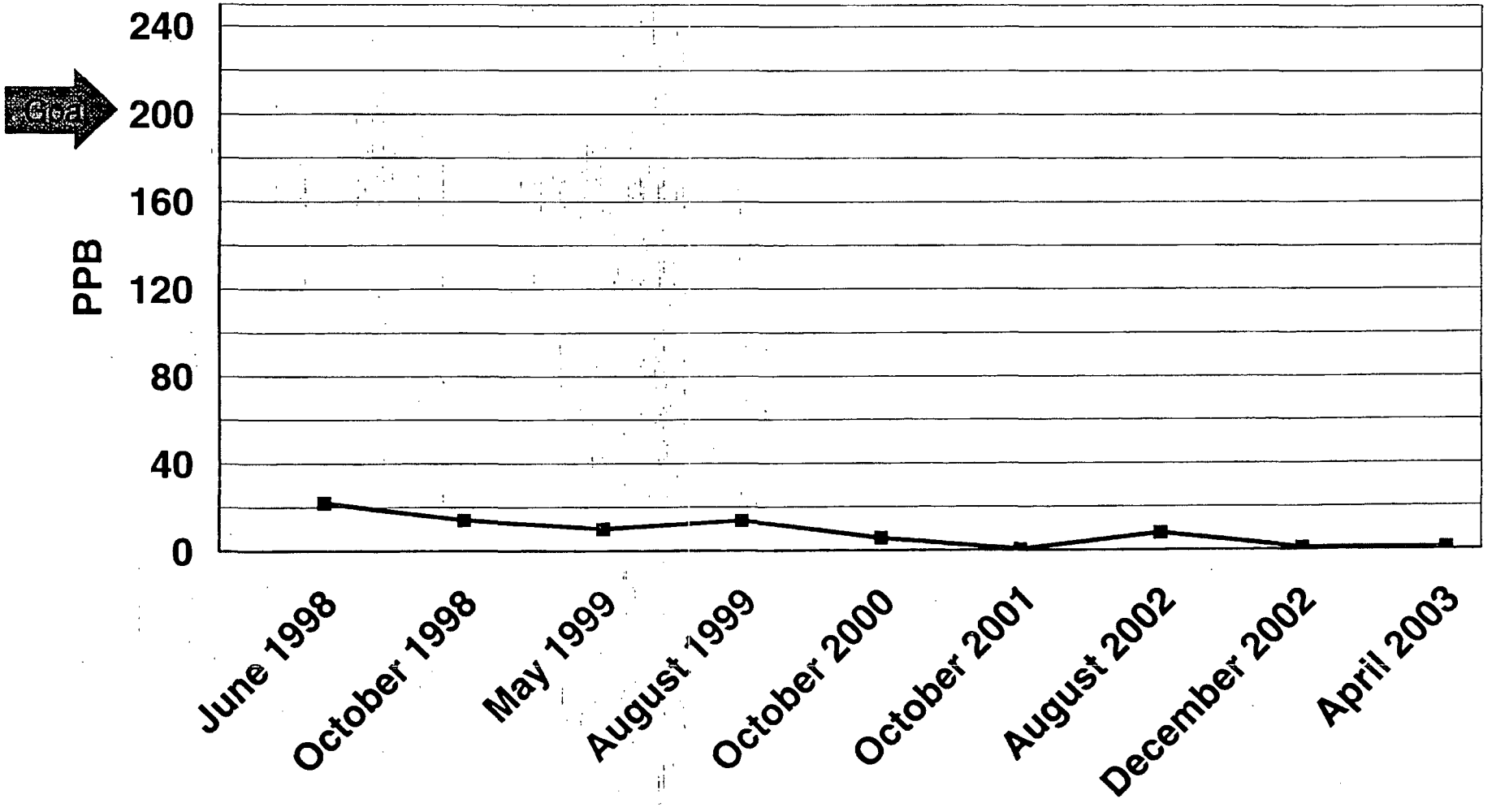
Distler Farm Site Well Sampling Data
June 1998 - April 2003
2-Butanone



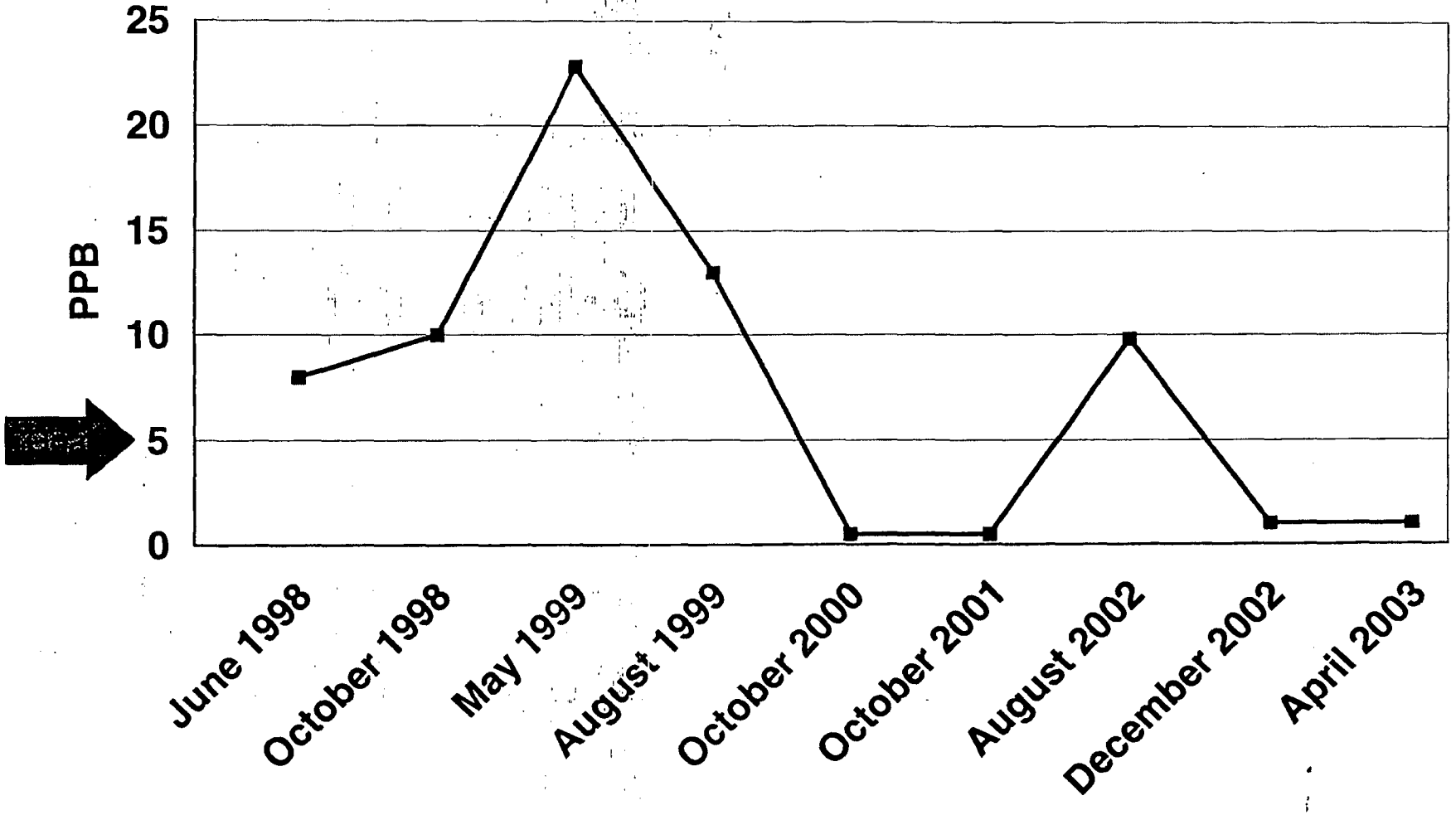
Distler Farm Site Well Sampling Data
June 1998 - April 2003
Trans1,2-Dichloroethylene



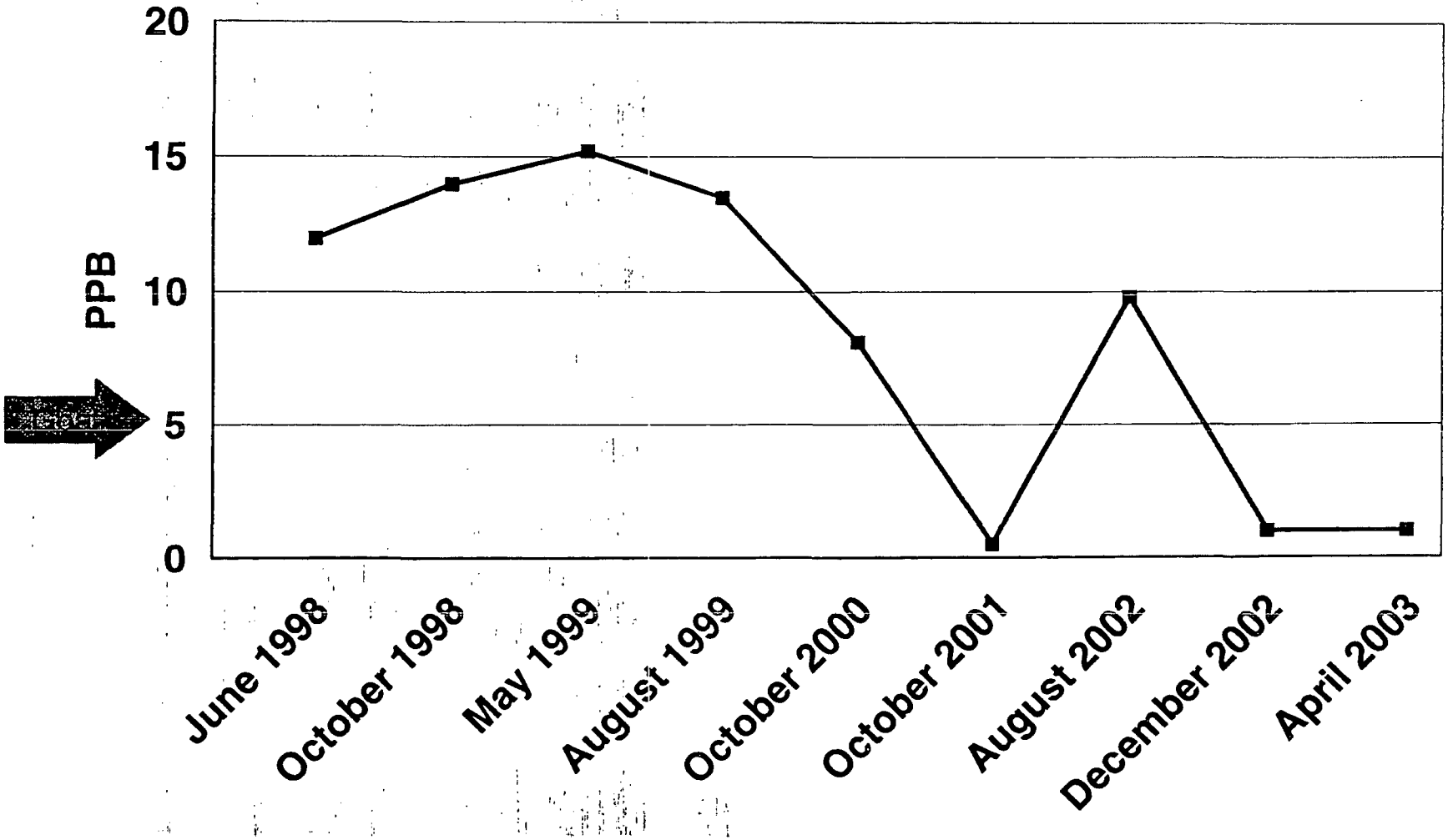
Distler Farm Site Well Sampling Data
June 1998 - April 2003
1,1,1-Trichloroethane



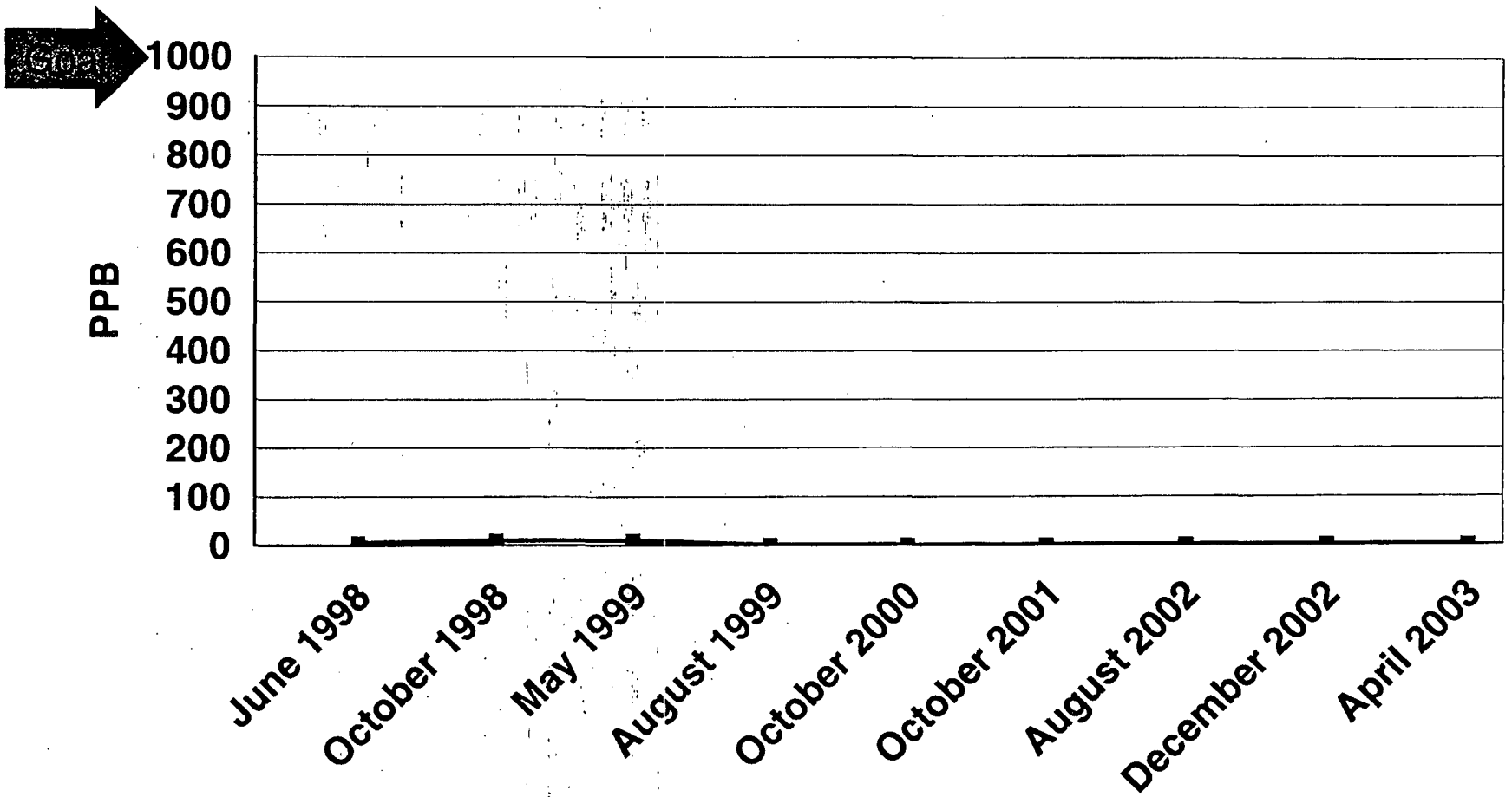
Distler Farm Site Well Sampling Data
June 1998 - April 2003
Trichloroethene



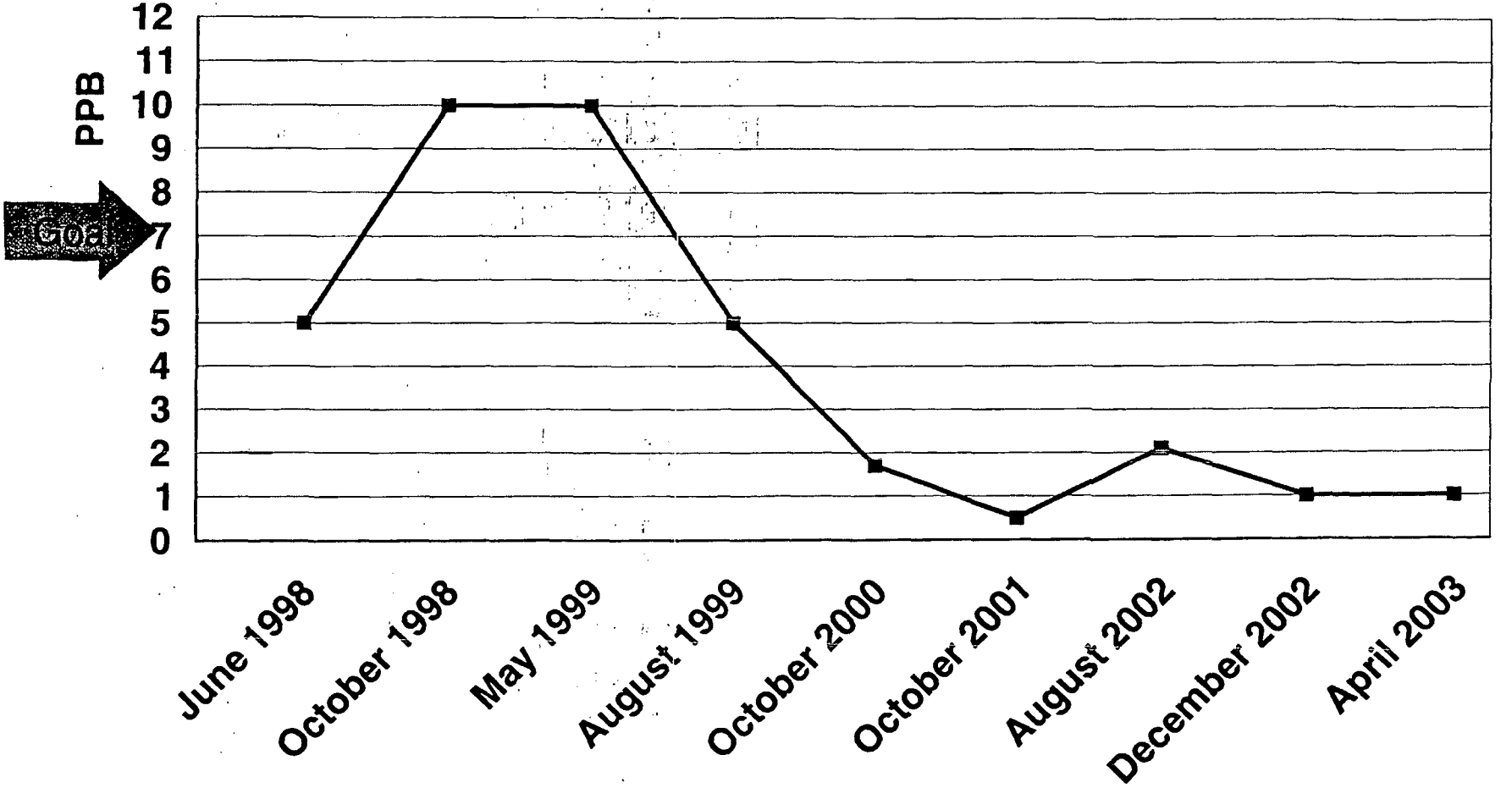
Distler Farm Site Well Sampling Data
June 1998 - April 2003
Benzene



Distler Farm Site Well Sampling Data
June 1998 - April 2003
Toluene



Distler Farm Site Well Sampling Data
June 1998 - April 2003
1,1-Dichloroethylene



APPENDIX 2

COMMUNITY INVOLVEMENT DOCUMENTS

Region 4

SUPERFUND FACT SHEET UPDATE

DISTLER FARM AND DISTLER BRICKYARD SITES WEST POINT, KENTUCKY

July, 2003

INTRODUCTION

This Superfund Fact Sheet has been prepared by the US Environmental Protection Agency (EPA) in cooperation with the Kentucky Division of Waste Management (KDWM). It has been prepared for the following two reasons:

1. To update the public on the progress of the Long-Term Remedial Action activities at the Distler Farm and Distler Brickyard Sites.

2. To inform the public that a Five Year Review of each site will be conducted shortly. The intent of the reviews is to evaluate the performances of the cleanup measures implemented at the sites to ensure continued protection of human health and the environment.

SITES' BACKGROUND AND HISTORY

Distler Farm Superfund Site

The Distler Farm Superfund Site is a little over 13 acres in size and is located near the city of West Point in Jefferson County, Kentucky. It is approximately one mile northeast of the Salt River and Ohio River confluence, and lies within the 10 year flood plain of the Ohio River. The property was being used for recycling and storage of industrial liquid waste when it was discovered in 1977, by EPA.

The Ohio River flooded the area in December 1978, and dumped drums of waste from the site along the nearby Stump Gap Creek. Following the flood, EPA and KDWM removed more than 800 scattered drums containing chemicals used in paint and varnish industries from the property and adjoining area. During the emergency action, several locations of buried waste were discovered on the property. Approximately 120 drums and more than 2,600 small containers of hazardous materials were excavated from the site and disposed of at approved facilities. Based on subsequent site studies, it was determined that the groundwater and soil were contaminated with volatile organic compounds (VOCs), such as toluene and benzene. Heavy metals, including chromium and lead were also found in the groundwater and soil.

Construction activities for permanent cleanup began at the site in 1988. During the process, additional drums were uncovered. The drums primarily contained medical and laboratory waste, herbicides and solvents. These, as well as more contaminated soil, were removed and sent outside the State for proper disposal. The affected area was backfilled with clean dirt and seeded with grass. Wells were installed in 1989 to extract contaminated water which has been trucked since then, periodically, to the Metropolitan Sewer District's facility for treatment and disposal. Based on the scheduled laboratory analyses of the extracted water samples, most of the contaminants in the groundwater have been reduced to safe levels by the cleanup activities. The remaining compounds will continue to be addressed until they reach acceptable concentrations. In addition to the monitoring wells, several private wells in the area have been tested for site related contaminants a number of times. The tests have not indicated that the wells have

UP-COMING FIVE-YEAR REVIEWS

EPA and the State will conduct a five-year review of the cleanup activities at these two sites between now and mid-September 2003. The reviews will critically examine how effective the remedies implemented at each of the sites have been, and if the remedies will continue to protect human health and the environment.

Two previous five year reviews were conducted on the Distler Farm Site. They were completed in September 1993, and September 1998, respectively. Both reports concluded that the remedy implemented at the site was providing human health and environmental protection adequately. The only previous review of the Distler Brickyard remedy was conducted in September 1998. The review concluded that the remedy was performing effectively, but that the contaminant recovery process was slow. Therefore, it recommended that the process be evaluated and modified for improvement.

As part of the current reviews, we are seeking your opinion on the cleanup activities conducted at the sites. We will interview a number of people by telephone, including nearby residents, local officials, and others to hear their views or concerns about the sites. If you would like to participate in this community involvement activity, please call 1-800-435-9233 and speak with Linda Starks, EPA Community Involvement Coordinator by July 31, 2003.

Once all data and public input have been received and evaluated, a Five-Year Review Report will be prepared for each site. Copies will be placed in the sites' Information Repository.

These reviews are scheduled to be completed by September 30, 2003. The next 5-year review should occur in 2008.

NEED FURTHER INFORMATION?

If you have technical questions about these two sites, please contact:

Femi Akindele **404-562-8809**
EPA Remedial Project Manager
US EPA, Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Ken Logsdon **502-564-6716**
State Project Manager
Kentucky Division of Waste Management
18 Reilly Road
Frankfort, KY 40601

For additional copies of this fact sheet or other general information contact:

Linda Starks **800-435-9233**
Community Involvement Coordinator
US EPA, Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

INFORMATION REPOSITORY

A copy of various documents, data reports and other site related information have been made available to the public and placed in the:

West Point City Hall
5909 Elm Street
West Point, KY 40177

United States Environmental Protection Agency
Region 4: AL, FL, GA, KY, MS, NC, SC, TN
Office of External Affairs

Sam Nunn Atlanta FederalCenter
61 Forsyth St. SW
Atlanta, GA 30303-3104

Environmental News

PHONE: (404) 562-8327
FAX: (404) 562-8335

THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)WILL CONDUCT FIVE-YEAR REVIEWS OF THE DISTLER FARM SITE IN WEST POINT, JEFFERSON COUNTY, KENTUCKY AND DISTLER BRICKYARD SITE IN WEST POINT, HARDIN COUNTY, KENTUCKY

The U.S. Environmental Protection Agency (EPA) today announces that two separate five-year reviews are being conducted for the cleanup at the Distler Farm and Distler Brickyard sites. The five year reviews will evaluate the remedies implemented at the sites and determine if they are still protective of human health and the environment. The remedies implemented at both sites included: soil excavation and treatment, groundwater extraction/treatment/discharge and monitoring. Presently, both sites are undergoing the process of final groundwater clean up known as Long-Term Remedial Action. Previous reviews concluded that the remedial activities have remained effective.

The Distler Farm site is a 13-acre property that was used for industrial waste storage. Studies of the site indicated that soil and groundwater were contaminated with volatile organic compounds (VOCs), such as toluene and benzene, and heavy metals such as chromium and lead. Approximately 3,000 people reside within four miles of the site. The Distler Brickyard site covers approximately 3 acres and is a portion of an abandoned brick manufacturing plant. In 1976, the Kentucky Liquid Recycling Inc. leased and began to use the property for storage of waste. During the initial inspection, approximately 2,300 drums were found at this site. Most of the drums contained chemicals, sludge, and solids which had deteriorated causing harm to the ground surface and surrounding environment. Approximately 70,000 people depend on private wells within a 3-mile radius for drinking water. Permanent cleanup began in 1988 at both sites.

Additional information about the sites may be obtained by contacting Linda Starks, EPA Community Involvement Coordinator at 1-800-435-9233 or Femi Akindele, EPA Remedial Project Manager at 404-562-8809.

-0- August 6, 2003

CONTACT: Kathy Armstrong, EPA Media Relations, (404) 562-8225

A Five-Year Review is being conducted of the clean up activities taken at the Distler Farm and Distler Brickyard Sites (Jefferson County) in West Point, Kentucky. A copy of the report will be placed in the Administrative Record & Information Repository files located in the EPA Record Center, 11th Floor, 61 Forsyth Street, SW, Atlanta, GA 30303, and the West Point City Hall, 5909 Elm Street, West Point, KY.

Permanent clean-up began in 1988 at Distler Farms and Distler Brickyard Sites. The remedies implemented at both Sites included: soil excavation and treatment; groundwater extraction/treatment/discharge/monitoring. To enhance cleanup at Distler Brickyard Site, certain materials were injected into the most contaminated areas to degrade the contaminants. Based on samples taken of the groundwater, it appears that the selected remedy has removed some of the contaminants, and the remedy remains protective of human health and the environment.

The Five Year Review process is evaluating the remedies implemented at the site and determine if they are still protective of human health and the environment. Two previous reviews occurred in 1993 and 1998. Both reviews concluded that the remedial activities at the Site remained effective. The current review will evaluate present Site conditions.

EPA will also conduct a number of telephone interviews with nearby residents, local officials, state officials, and others to obtain their opinion on the clean up process. If you would like to speak with us about this Site, please call Linda Starks, EPA Community Involvement Coordinator, at 1-800-435-9233 or 404-562-8487. If you have any technical questions, please contact Femi Akindele, EPA Site Project Manager at 404-562-8809.

Distler Farm
5-Year Review Questionnaire

West Point, Kentucky

Do you live near the Site? **Yes, about 1½. If yes, how long? About 7 years and her husband has lived there all of his life.**

Are you familiar with EPA activities over the past years? **Yes. My husband usually attend meetings on the site.**

What is your overall impression of the project? **I don't see the site that often because I work in the City, but my husband passes by the site every day and he hasn't had any problems.**

Overall, have you been pleased or displeased with cleanup actions at this Site? **Pleased.**

What effects, if any, have site operations had on the surrounding community? **None**

Do you still have any concerns regarding EPA clean up activities of the Site? **Yes. There has been concern about the drinking water.**

Do you think you have been kept adequately informed about clean up activities at the Site? **Yes.**

Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details. **No.**

Is there someone else that you would like to recommend we contact for more information? **No.**

Do you have any suggestions that EPA can implement to improve communication with the public? **No.**

Interview Conducted by: **Linda Starks**
Date Conducted: **August 19, 2003**

Distler Farm
5-Year Review Questionnaire

West Point, Kentucky

Do you live near the Site? **Yes, 1 mile from the Farm.** If yes, how long? **58 years**

Are you familiar with EPA activities over the past years? **Yes**

What is your overall impression of the project? **Everything seems fine.**

Overall, have you been pleased or displeased with cleanup actions at this Site? **Pleased.**

What effects, if any, have site operations had on the surrounding community? **None**

Do you still have any concerns regarding EPA clean up activities of the Site? **No.**

Do you think you have been kept adequately informed about clean up activities at the Site? **Yes.**

Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details. **No.**

Is there someone else that you would like to recommend we contact for more information? **No.**

Do you have any suggestions that EPA can implement to improve communication with the public? **No.**

Interview Conducted by: **Linda Starks**
Date Conducted: **August 19, 2003**

Distler Farm
5-Year Review Questionnaire

West Point, Kentucky

Do you live near the Site? **Yes, about 3 miles.** If yes, how long? **7 years and husband has lived there 31 years.**

Are you familiar with EPA activities over the past years? **Yes**

What is your overall impression of the project? **Looks cleaner but there is bad odor coming from the site when you pass by. It is less of an eye sore.**

Overall, have you been pleased or displeased with cleanup actions at this Site? **Pleased.**

What effects, if any, have site operations had on the surrounding community? **None**

Do you still have any concerns regarding EPA clean up activities of the Site? **Yes. By the site being so close to the river we are wondering about the smell and how that could effect the air.**

Do you think you have been kept adequately informed about clean up activities at the Site? **Yes. The flyer we received two months ago help me learn more about the site.**

Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details. **No.**

Is there someone else that you would like to recommend we contact for more information? **No.**

Do you have any suggestions that EPA can implement to improve communication with the public? **No, the literature was sufficient.**

Interview Conducted by: **Linda Starks**
Date Conducted: **August 19, 2003**

Distler Farm
5-Year Review Questionnaire

West Point, Kentucky

Do you live near the Site? **Yes, about 1mile.** If yes, how long? **28 years**

Are you familiar with EPA activities over the past years? **Yes**

What is your overall impression of the project? **OK**

Overall, have you been pleased or displeased with cleanup actions at this Site? **Pleased.**

What effects, if any, have site operations had on the surrounding community? **None**

Do you still have any concerns regarding EPA clean up activities of the Site? **No, not Distler Farm, but there is an Oil Refinery on Dixie Hwy and Hwy 44 that has terrible odors coming from the old tanks. The community feels that the odor is so bad it attributes to headaches (especially when it rains).**

Do you think you have been kept adequately informed about clean up activities at the Site? **Yes.**

Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details. **No.**

Is there someone else that you would like to recommend we contact for more information? **No.**

Do you have any suggestions that EPA can implement to improve communication with the public? **It would be nice if EPA could come to occasional Council Meetings to keep the neighborhood abreast of any activities.**

Interview Conducted by: **Linda Starks**
Date Conducted: **August 19, 2003**

Distler Farm
5-Year Review Questionnaire

West Point, Kentucky

Do you live near the Site? **Yes, 2 miles.** If yes, how long? **20 years**

Are you familiar with EPA activities over the past years? **Yes**

What is your overall impression of the project? **They said they cleaned up the site, so its OK**

Overall, have you been pleased or displeased with cleanup actions at this Site? **Pleased.**

What effects, if any, have site operations had on the surrounding community? **None**

Do you still have any concerns regarding EPA clean up activities of the Site? **Yes. There have been several deaths that could have or have not been related to the site.**

Do you think you have been kept adequately informed about clean up activities at the Site? **No. When the site was first being cleaned up, they sampled the site more. And even though the site has been cleaned up, the community still need to know what's going on.**

Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details. **No events really. I have noticed there were hunters on the property.**

Is there someone else that you would like to recommend we contact for more information? **Yes. Beverly Jeffries (owns a business) seems to have had some concern. Also the City Council which consists of Eric Duvall (Mayor), Ted Akins (President City Council), Carl Hall, Billy ask, Marion Applegate, and Vernon Curles.**

Do you have any suggestions that EPA can implement to improve communication with the public? **Yes, EPA could come back and maybe come to a Council Meeting (which is held the 2nd Monday of each month) and let us know what's going on, good or bad. Also there could be a newsletter discussing the site. I know, I sat on the city council for 20 years and occasionally, there are still questions asked about Distler Farm and Brickyard.**

Interview Conducted by: **Linda Starks**
Date Conducted: **August 19, 2003**

Distler Farm
5-Year Review Questionnaire

West Point, Kentucky

Do you live near the Site? **Yes about 3 miles.** If yes, how long? **20 years**

Are you familiar with EPA activities over the past years? **Yes**

What is your overall impression of the project? **Everything seems to be fine.**

Overall, have you been pleased or displeased with cleanup actions at this Site? **Pleased**

What effects, if any, have site operations had on the surrounding community? **None**

Do you still have any concerns regarding EPA clean up activities of the Site? **No.**

Do you think you have been kept adequately informed about clean up activities at the Site? **Yes. I received a flyer about a month ago.**

Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details. **No.**

Is there someone else that you would like to recommend we contact for more information? **No.**

Do you have any suggestions that EPA can implement to improve communication with the public? **None**

Interview Conducted by: **Linda Starks**
Date Conducted: **August 19, 2003**

Distler Farm
5-Year Review Questionnaire

West Point, Kentucky

Do you live near the Site? **Yes** If yes, how long? **66 years**

Are you familiar with EPA activities over the past years? **Yes**

What is your overall impression of the project? **At first the project was of concern, but when they said it was clean there was not much concern. She still drinks bottled water though.**

Overall, have you been pleased or displeased with cleanup actions at this Site? **Pleased, but still concerned**.

What effects, if any, have site operations had on the surrounding community? **None**

Do you still have any concerns regarding EPA clean up activities of the Site? **Still concerned about cancer risks since her mother died in 1980 and she has cancer also. A lot of people in the community died from cancer.**

Do you think you have been kept adequately informed about clean up activities at the Site? **Yes. There has been no problems.**

Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details. **No.**

Is there someone else that you would like to recommend we contact for more information? **No.**

Do you have any suggestions that EPA can implement to improve communication with the public? **None**

Interview Conducted by: **Linda Starks**
Date Conducted: **August 4, 2003**

EXHIBIT 1

North Wind Environmental Inc.,
Summary Report of Data--Distler Farm Site

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EXPOSURE RESEARCH LABORATORY
P.O. BOX 93478 • LAS VEGAS, NV 89193-3478

SEP 26 2002

OFFICE OF
RESEARCH AND DEVELOPMENT

MEMORANDUM

SUBJECT: Final Data Summary, Distler Farm Site Kentucky

FROM: Christopher Sibert, Acting Director,
Technology Support Center for Monitoring and Site Characterization,
National Exposure Research Laboratory,
Environmental Sciences Division, Las Vegas

TO: Femi Akindele, RPM,
USEPA Region IV

Femi, as per your request, please find attached the subject report for the Distler Farm Superfund Site located in Jefferson County, Kentucky. This report, prepared by North Wind Environmental, provides a comprehensive summary of data collected at the site since its discovery and evaluates the data in the context of effectiveness of the pump and treat long-term remedial action.

It was a pleasure working with you and Ken Logsdon of Kentucky's Department for Environmental Protection on this project. If you have any questions, and/or need further explanation of the report, please call me at (702) 798-2270.

Attachment

cc: Ken Logsdon, State of Kentucky

cc: w/o Attachment
Rich Steimle, USEPA, 5102G

NWE-ID-2002-043
Revision 0

Summary Report of Data Collected at the Distler Farm Site, Jefferson County, Kentucky, 1983-2001

Angela Allison
Jennifer Martin

September 2002

NWE-ID-2002-043
Revision 0

Summary Report of Data Collected at the Distler Farm Site, Jefferson County, Kentucky, 1983-2001

Prepared by:

Angela Allison
Jennifer Martin
North Wind Environmental, Inc.
Idaho Falls, ID

September 2002

Prepared for the
U.S. EPA National Exposure Research Laboratory, Technical Support Project,
Characterization Research Division
and for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE Idaho Operations Office
Contract DE-AC07-99ID13727

ABSTRACT

The Distler Farm Site contains metals and organic contamination in soil and groundwater as a result of improper waste handling practices. The 1986 Record of Decision (ROD) called for the installation of a groundwater extraction and treatment system for remediation of contaminated groundwater. The pump and treat long-term remedial action (LTRA) was installed in 1988-89. The purpose of this report is to summarize and interpret the available analytical data generated from monitoring of the LTRA at the Distler Farm Site. This activity is being performed to support decision-making regarding the need for additional remediation activities at the Distler Farm Site.

Monitoring data were available from the Remedial Investigation (RI) (1984) and post-ROD (1987 – 2001) groundwater sampling events. In general, it does not appear that a consistent monitoring program was used at the Distler Farm Site over the years since the installation of the long-term remedial action, and for this reason, the resulting data set is not comprehensive. Also, following the RI, monitoring was confined to the Fine-Grained Alluvium (FGA); no data were available from the Coarse-Grained Alluvium (CGA) following the RI monitoring. Two wells, Monitoring Well (MW)-17 and MW-19, were sampled on a relatively consistent basis from 1996 – 2000, and the data collected from these wells are used to evaluate long-term trends in the concentrations of contaminants of concern (COCs). Because of their locations with respect to the soil and groundwater contamination zones, the data from these wells represent conditions in the source area (MW-17) and the downgradient groundwater contamination zone (MW-19). Trends from these wells indicate that contaminant concentrations have fluctuated over time since 1996. Increases in metal concentrations (specifically arsenic, lead, and chromium) are most likely due to the collection and analysis of turbid samples. Fluctuations in concentrations of the organic contaminants (specifically benzene and trichloroethene) may be in part due to natural fluctuations in seasonal precipitation/recharge and the resulting impact to geochemical conditions and subsequently contaminant flux.

As of the most recent sampling event (October 2000), four COCs (arsenic, chromium, lead, and benzene) remain above maximum concentration limits (MCLs). The remaining COCs were below the respective MCLs. A quarterly monitoring plan is recommended to evaluate the COC concentrations in the FGA and the CGA to determine if the Distler Farm Site is free of contamination above MCLs. It is recommended that quarterly sampling be performed in 2 consecutive years in order to determine COC concentrations with respect to MCLs in the source area and downgradient groundwater contamination zones. It is recommended that sampling be performed at MW-17 and MW-19 (screened in the FGA) and MW-21 and MW-01 (screened in the CGA), allowing an assessment of both the source area and groundwater leaving the site via the CGA. If the results of the quarterly monitoring indicate that no contamination above MCLs is present, then it is believed that an argument can be made to discontinue remedial activities at the site.

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ACRONYMS

bls	below land surface
CGA	coarse-grained alluvium
COC	contaminants of concern
DCE	dichloroethylene
EEB	Environmental Emergency Branch
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FGA	fine-grained alluvium
LTRA	long-term remedial action
MCL	maximum concentration limit
MDL	method detection limit
MW	monitoring well
NRDC	National Resources Defense Council
PCB	polychlorinated biphenyls
PCE	tetrachloroethylene
ppb	parts per billion
RA	Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
RW	recovery well
TCA	trichloroethane
TCE	trichloroethylene
VC	vinyl chloride
VOC	volatile organic compound

Summary Report of Data Collected at the Distler Farm Site, Jefferson County, Kentucky, 1983-2001

1. OBJECTIVES AND ORGANIZATION

The purpose of this report is to present the results of sampling activities conducted at the Distler Farm Site (hereafter referred to as the Site) in Jefferson County, Kentucky since the discovery of soil and groundwater contamination in 1977. Results are presented to evaluate the effectiveness of the long-term remedial action (LTRA) in reducing concentrations of contaminants of concern (COCs) to below maximum contaminant levels (MCLs). It is expected that the presentation and evaluation of data presented in this report will provide the information necessary to support decision-making regarding the need for additional remedial activities at the Site.

Section 2 presents the history of the Site, including the geologic and hydrologic setting, the regulatory history, and the remedial action activities. Section 3 presents the results of the data collection activities performed at the Site to date. Section 4 discusses the results of these data collection activities in the context of the completeness of the dataset, the trends in contaminant concentrations over time, the factors that affect contaminant transport at the Site, and presents conclusions with respect to current Site conditions. Finally, Section 5 presents technical recommendations based on the discussion. References cited in this document are given in Section 6.

2. SITE HISTORY

The Site, discovered in 1977 during the development of an enforcement case against Donald Distler, is located in the Ohio River Valley, 1 mile northeast of West Point, Kentucky, and approximately 15 miles southwest of Louisville, Kentucky (see Figure 2-1). The Site, a 13.68-acre farmland tract, is bordered by U.S. Highway 60/31 W (Dixie Highway) on the northwest; Stump Gap Creek on the southeast; and by cultivated farmland on the northeast and southwest (NUS 1986). Drums containing industrial wastes were discovered in 1977 at the Site, prompting a subsequent investigation by the Environmental Protection Agency (EPA). Based on the results of the investigation, a pump and treat remediation system was installed to remediate groundwater to levels specified in the 1986 Record of Decision (ROD) and 1988 Explanation of Significant Differences (ESD). This system has been in operation since 1989, during which time contaminant levels have been monitored.

The following sections provide background on the site geology and hydrology (Section 2.1), the regulatory history (Section 2.2), and the remedial action activities conducted to date (Section 2.3).

2.1 Geology/ Hydrology

The Site is underlain by Quaternary-age alluvium and glacial outwash deposits of the Ohio Valley Alluvium (Ecology and Environment 1982), which can be split into two hydrostratigraphic units, Fine-Grained Alluvium (FGA) and Coarse-Grained Alluvium (CGA) (see Figure 2-2). The FGA is a laterally continuous, moderately dry to wet unit extending from the surface to approximately 24 to 48 ft below land surface (bls), dipping to the northwest. The FGA can further be split into two subunits, Unit 1 and Unit 2. Unit 1 consists of soft to stiff, moderately dry to wet, clayey silts/silty clays with interbedded silty sands and black organic material. Unit 2 consists of sandy silt to well graded fine-grained sand with interbedded silt/clay, minor gravel lenses, and organic rich clays and peats. The base of the FGA is gently inclined to the southeast (NUS 1986). The CGA, directly underlying the FGA, is a laterally continuous, saturated, gravelly sand-to-sandy gravel unit with minor silts and clays. The CGA lies unconformably on a weathered Mississippian silty shale to siltstone bedrock at 75.4 to 90 ft bls (NUS 1986).

Three groundwater zones were identified during completion of the Remedial Investigation (RI). Groundwater is present in Unit 1 as a shallow perched zone encountered at depths ranging between 7.5 and 18 ft bls, probably representing local, discontinuous saturated lenses of sediment. Vertical permeability laboratory measurements of sediments collected from the upper 12 ft of Unit 1 range from 2.3×10^{-7} to 1.0×10^{-8} cm/sec. Groundwater is present in Unit 2 as an unconfined, saturated zone between 19 and 40 ft bls. Slug tests yielded hydraulic conductivities in Unit 2 of between 1.0×10^{-3} cm/s to 3.4×10^{-4} cm/s. Generally, groundwater within both Units 1 and 2 of the FGA flows to the southeast towards Stump Gap Creek (NUS 1986).

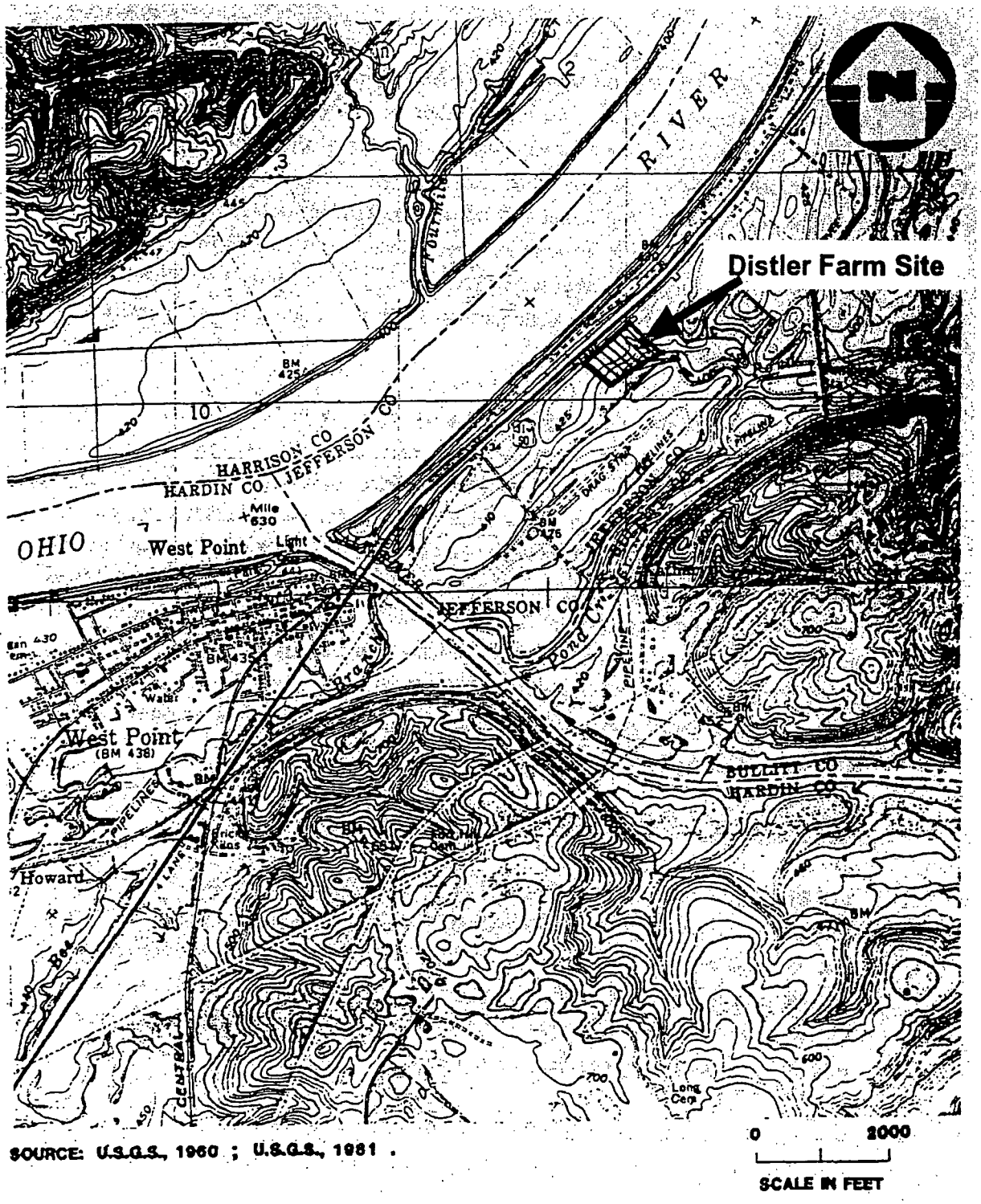

Figure 2-1. Location map for the Distler Farm Site.

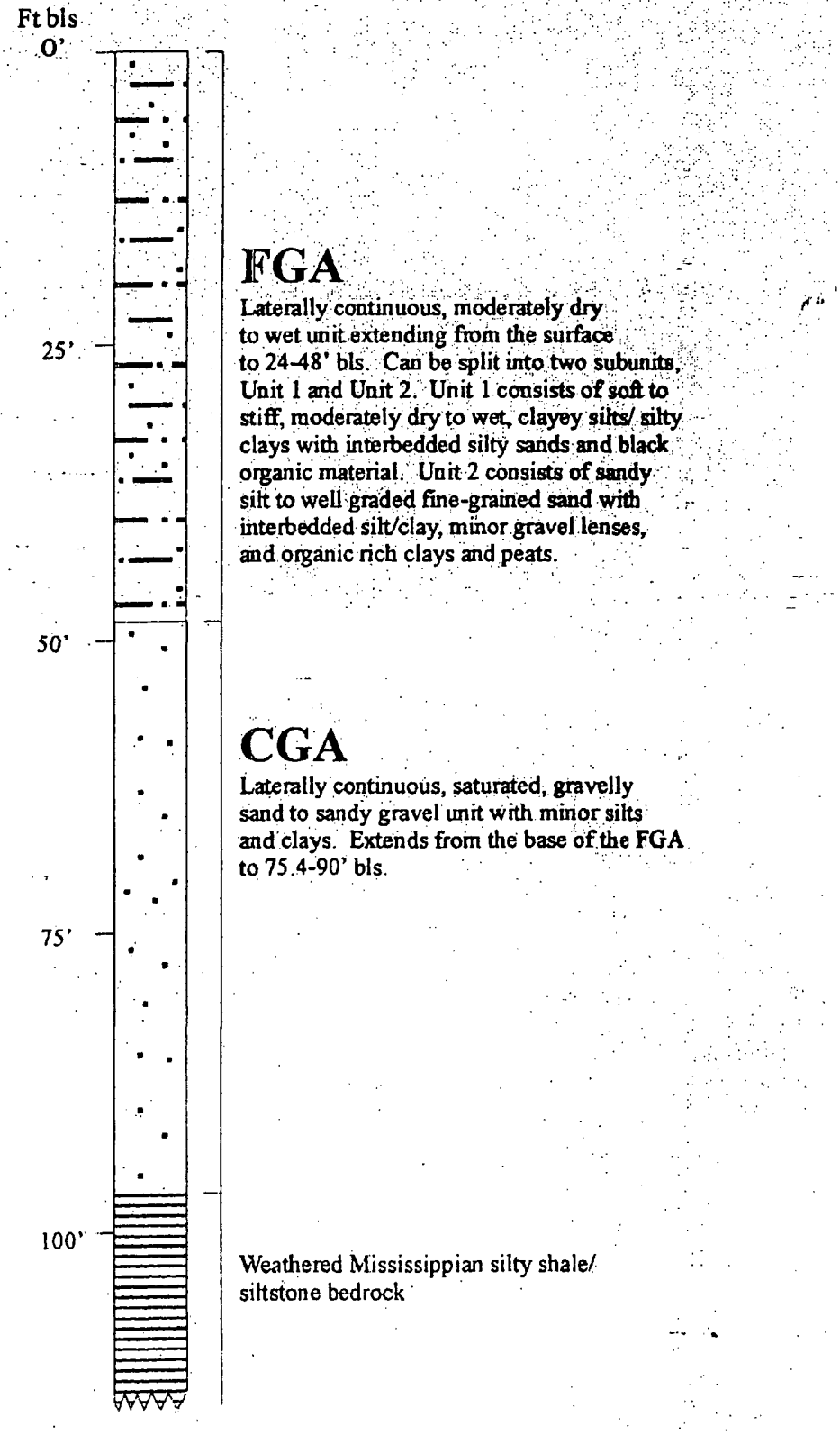

Figure 2-2. Generalized stratigraphic column showing hydrostratigraphic units at the Distler Farm Site.

The CGA, the regional groundwater supply source, is saturated throughout and under unconfined to semi-confined conditions in the site area. A head difference between the FGA and CGA indicates a vertical flow component from the FGA to the CGA. Because the Site is close to and in direct hydrologic connection with the Ohio River, slight changes in river stage can effectively alter the direction of groundwater flow in the CGA. Data compiled during the RI indicate that groundwater in the CGA flows in either a southeast or northwest direction in response to river stage fluctuations. It was also noted that water levels within the CGA fluctuate quite dramatically (up to +/- 14 ft) in response to changing water levels in the Ohio River (NUS 1986).

The Site is located within the Salt River Drainage Basin, which discharges into the Ohio River near West Point, Kentucky. It is located within the 10-year floodplain of Stump Gap Creek and is frequently inundated with floodwaters (CH2MHill 1983).

2.2 Regulatory History

This section presents a timeline of the regulatory history of the Site beginning in 1978. In December 1978, drums containing industrial waste were scattered across the site during flooding of the Ohio River and its tributaries. The Governor of Kentucky declared the Site an environmental emergency and asked for assistance from the EPA. In early 1979, the EPA Environmental Emergency Branch (EEB) recovered and recontainerized 832 drums. The drums contained chemicals characteristic of the paint and varnish industry (Ecology and Environment 1981), including over 73 organic compounds and metals. Thirty-four of the identified compounds are on the National Resources Defense Council (NRDC) list of priority pollutants including vinyl chloride, toluene, ethyl benzene, naphthalene, phenol, chloroform, chromium, and lead (NUS 1983). The drums were later taken to an approved disposal facility (Ecology and Environment 1981). Surface water and sediment samples collected from Stump Gap Creek and water samples from nearby private wells collected between January and June 1979 showed no definitive evidence of contamination due to the Site (CH2MHill 1983; NUS 1986).

Characterization activities continued prior to the RI with the collection of soil and groundwater seepage samples from 8 to 20-ft soil borings in October 1981. The results indicated that contamination had migrated downgradient of the source area. Four nearby private wells indicated no contamination. Magnetic and resistivity studies were performed in late 1981 and early 1982 to confirm locations of four underground drum disposal sites and a groundwater contamination plume containing organic compounds and metals that was believed to be migrating off-site (Ecology and Environment 1982; CH2MHill 1983; NUS 1983). Twenty groundwater monitoring wells (MWs), installed to monitor the contamination plume, were sampled in July 1983. Samples collected in Unit 1 of the FGA indicated seven organic priority pollutants (methylene chloride; 1,1,1-trichloroethane; benzene; toluene; isophorone; bis (2-ethylhexyl) phthalate; and naphthalene); nine inorganic priority pollutants (arsenic, cadmium, chromium, lead, antimony, zinc, mercury, nickel, and copper); and several ketone and alcohol derivatives. Samples collected in Unit 2 of the FGA indicated the presence of bis (2-ethylhexyl) phthalate, antimony, zinc, and lead (NUS 1986; NUS 1983).

In February 1984, approximately 120 55-gal drums and 2,620 smaller containers were unearthed by the EPA from the four disposal areas identified in late 1981 and early 1982. Sampling indicated toxic, volatile, ignitable, radioactive (lab packs), and reactive wastes. All wastes and visibly contaminated soils were removed from the site and disposed of in approved hazardous waste facilities (NUS 1986).

The RI assessment of the nature and extent of contamination began in July and September 1984. Surface water and sediment samples collected along Stump Gap Creek in 1984 revealed no contamination, confirming previous results. Two rounds of groundwater samples from 12 onsite wells, six nearby residential wells, and composite soil samples from suspect locations were collected during this

period. Four deep groundwater MWs, installed and screened in the CGA, were also sampled (NUS 1986). The source of contamination at the Site was determined to be the waste container storage and burial areas; although, the investigation team believed that all source material had been removed from the Site. Results of the RI indicated a contaminated groundwater "pool" containing contaminant organics and metals beneath the Site in the FGA, which most likely had not migrated offsite due to topography, groundwater flow, soil characteristics, and contaminant properties. Figure 2-3 shows the locations of the soil contamination zone (source area) and groundwater contamination zone, both located in the FGA. While no contaminants were detected in CGA wells, the potential for migration of contaminants into the CGA, and potentially off-site from beneath this "pool," was considered a possibility (NUS 1986).

The ROD, prepared in August 1986, identified the following COCs in soil: chromium, lead, benzene, toluene, trichloroethylene (TCE), tetrachloroethylene (PCE), naphthalene, bis (2-ethylhexyl) phthalate, di-n-butyl phthalate, and isophorone. Test data indicated the contaminants had been released, distributed, or migrated to soil depths of 6 in. to 4 ft bls. Contaminants of concern identified in groundwater included chromium, lead, 1,1,1-trichloroethane (1,1,1-TCA), 1,2-trans-dichloroethylene (t-1,2-DCE), toluene, TCE, vinyl chloride (VC), bis (2-ethylhexyl) phthalate, di-n-butyl phthalate, isophorone, and naphthalene (EPA 1986). As stated above, contamination zones were delineated in soil and groundwater (as shown in Figure 2-3), and contamination at that time was confined to the FGA (NUS 1986) (see Figure 2-3). Section 3.1 presents a detailed description of sampling activities and results.

The remedial action (RA), as specified in the ROD and the ESD, consisted of soil excavation, groundwater extraction, temporary onsite storage and subsequent transport, and treatment at an off-site treatment facility (EPA 1986; EPA 1988). Groundwater would be remediated to health-based MCLs based on then-current drinking water standards, as listed in Table 2-1. Soil would only be excavated to the extent necessary to ensure that no water leaching into the aquifer would exceed the MCLs. Based on these criteria, it was subsequently determined that no soil excavation would be necessary because contamination levels in the soil were below those levels that would cause groundwater concentrations to be greater than drinking water standards (EPA 1988).

Table 2-1. Health-based MCLs* for COCs in groundwater.

Contaminant	Health Based MCL* (ppb)
Arsenic	50
Chromium	50
Lead	50
2-butanone	170
Trans-1, 2-dichloroethene	70
1,1,1-trichloroethane	200
Trichloroethylene	5
Benzene	5
Toluene	2,000
1,1-dichloroethylene	7

* MCLs current per ROD (1986).

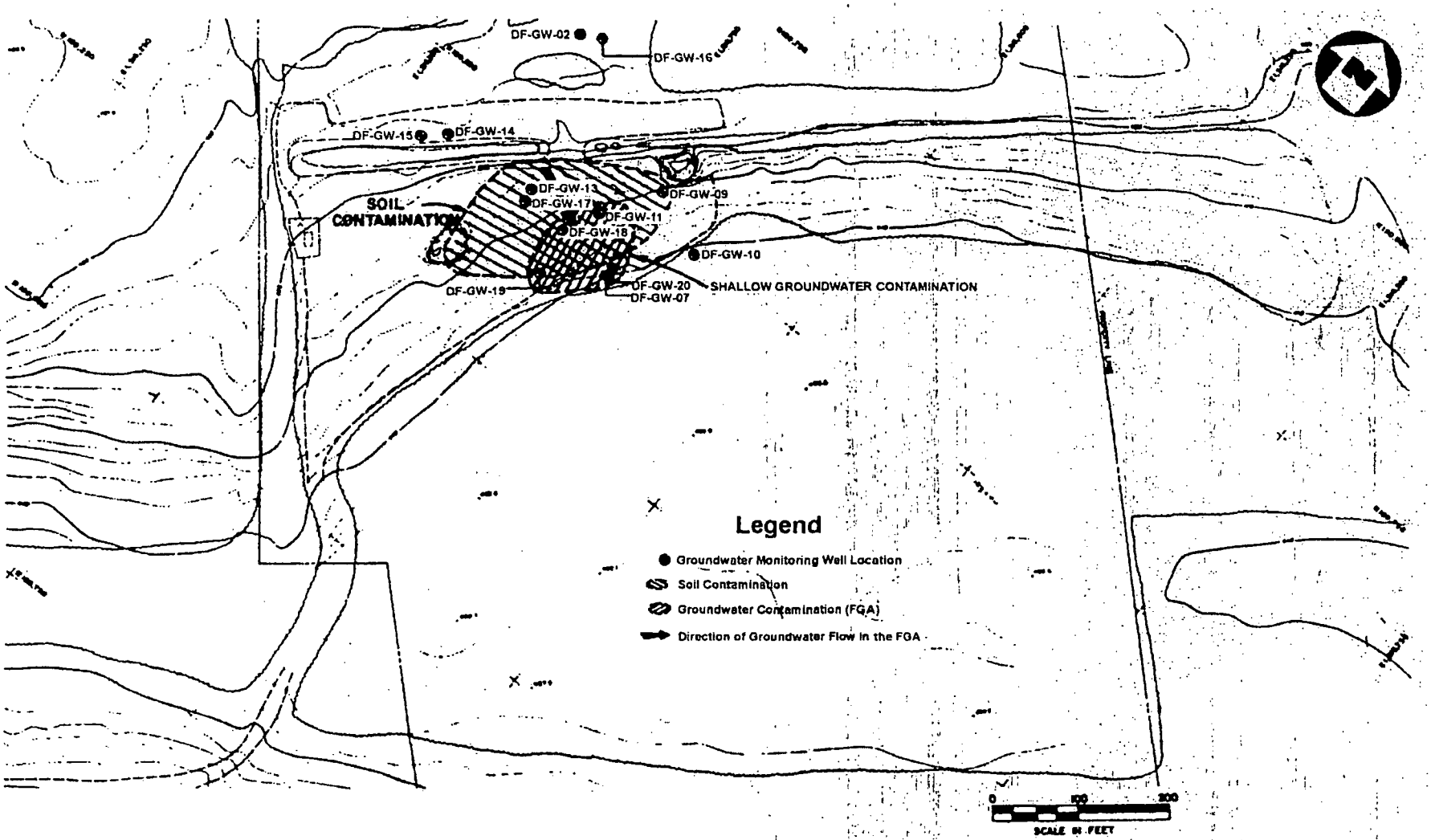

Figure 2-3. Extent of soil and groundwater contamination delineated during the RI.

2.3 Remedial Action Activities

The RA, initiated in November 1988, consisted of (1) construction of an access road and turn-around area, (2) recovery well installation, (3) installation of the groundwater recovery system, and (4) site restoration. During excavation activities for construction of the access road and turn-around area, two additional underground drum storage areas were identified (see Figure 2-4). The drums contained organic solvents, loose laboratory bottles, and hospital waste. They were unearthed, removed, and the soils surrounding the areas were excavated. Utilizing a metal detector, a third drum storage area was located and excavated (see Figure 2-4). The drum contents consisted of laboratory bottles, solvent liquids, a pinkish gray paint waste, and one drum of a white granular solid. All visibly contaminated and underlying soils were excavated at each location. Confirmation samples were collected to ensure that all contaminated soils had been removed (EPA OSC Report).

From December 1988 through January 1989, eight groundwater recovery wells were installed to an average depth of 26 ft roughly parallel to Stump Gap Creek on the southeast side of the site along the tree line (see Figure 2-4). The recovery wells were designed to capture the groundwater contamination plume, which was slowly migrating to the east-southeast in the FGA. Construction of the groundwater removal and storage facility took place July 1989 through September 1989. This facility consists of a storage tank that collects contaminated groundwater pumped from the eight recovery wells. Areas disturbed during construction of the remediation system were reseeded, riprap was laid in low-lying areas, the culvert under the access road was replaced, and the well vaults were secured (EPA OSC Report). The remediation system was tested in 1989 and a permit application was filed with the Metropolitan Sewer District for disposal of groundwater from the Site.

The LTRA began in December 1991. By August 31, 1993, approximately 355,000 gal of groundwater had been extracted from the Site. The LTRA appeared to be effective based on monitoring of COC concentrations. This was attributed to source removal, soil excavation around source material, and the on-going groundwater remedial action. However, at that time (1993) four COCs remained above MCLs, including t-1,2-DCE, 1,1-DCE, TCE, and benzene. These contaminants were detected primarily within groundwater samples collected from Recovery Well 5 (see Figure 2-4) (Akindele 1993).

In early 1996, the Commonwealth of Kentucky took over LTRA operations as a State-Lead Fund-Financed Remedial Action. In 1998, it was determined that the LTRA had been effective in remediating the Site and that the clean-up objectives had been achieved based on declining contaminant trends in the groundwater. Therefore, it was recommended to begin the process of terminating the LTRA. Quarterly groundwater monitoring for 1 year was recommended. If at least three of the four quarterly results indicated COC concentrations similar to current levels or lower, then the LTRA would be deemed complete (Petitjean 1999). It appears that quarterly data were collected at 2 MWs (MW-17 and MW-19) for three quarters (May 1999, August 1999, and November 1999), and then again approximately 1 year later (October 2000). Section 3 presents the results of these monitoring activities.

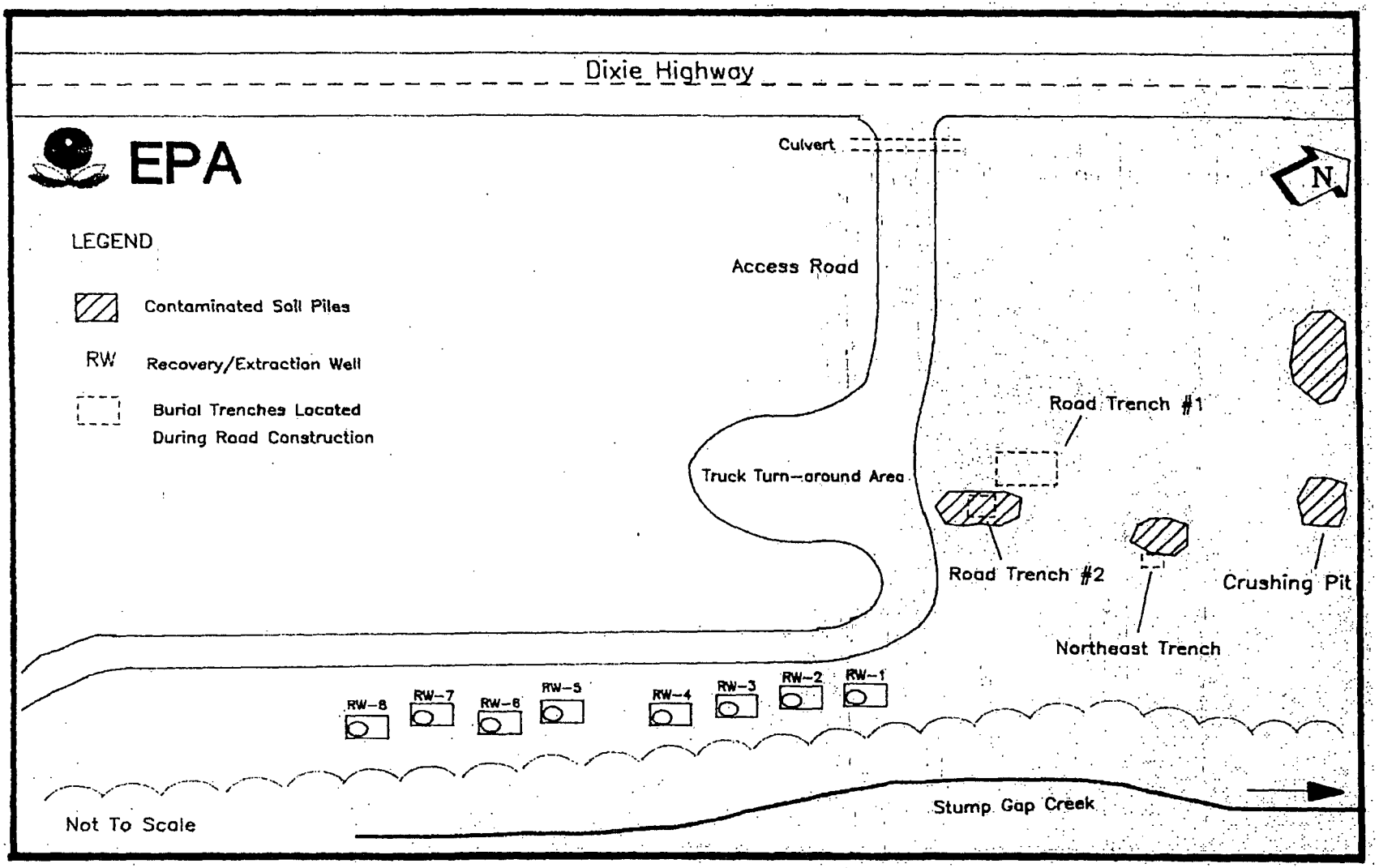

Figure 2-4. Locations of excavated waste and recovery wells.

3. RESULTS OF DATA COLLECTION ACTIVITIES

This section outlines the data collected during the RI and post-ROD sampling events. The data collected during the RI were used to determine specifications for the LTRA, as outlined in the ROD and ESD (Section 3.1). The post-ROD sampling data are presented here in order to evaluate the effectiveness of the LTRA (Section 3.2).

3.1 RI Groundwater Sampling Events

Twenty-four groundwater MWs were installed during the RI (MW-01 through MW-24). Two phases of groundwater sampling were conducted during the RI in July and September 1984. Twelve onsite wells were sampled in July 1984 and eight wells were sampled in September 1984 of the investigation (see Figure 3-1). All groundwater samples were analyzed for: hazardous substance list metals and cyanide, volatile organic compounds (VOCs), extractable organic compounds, pesticides, and polychlorinated biphenyls (PCBs) (NUS 1986).

Results for COCs identified in the ROD for these two phases of groundwater sampling are in Tables 3-1 and 3-2, with the exception of 2-butanone. Data for this analyte were absent from the analytical data presented in the RI Report. As shown in Tables 3-1 and 3-2, groundwater contamination was limited to wells screened in Units 1 and 2 of the FGA. The areal extent of the groundwater contamination zone in the FGA is shown in Figure 2-3. Additionally, there was no evidence to indicate contamination above MCLs in wells screened in the CGA (see Tables 3-1 and 3-2). The COCs present above MCLs in the FGA included chromium, lead, t-1,2-DCE, 1,1,1-TCA, TCE, and 1,1-DCE. The remaining COCs were below MCLs at the time of the RI (1984).

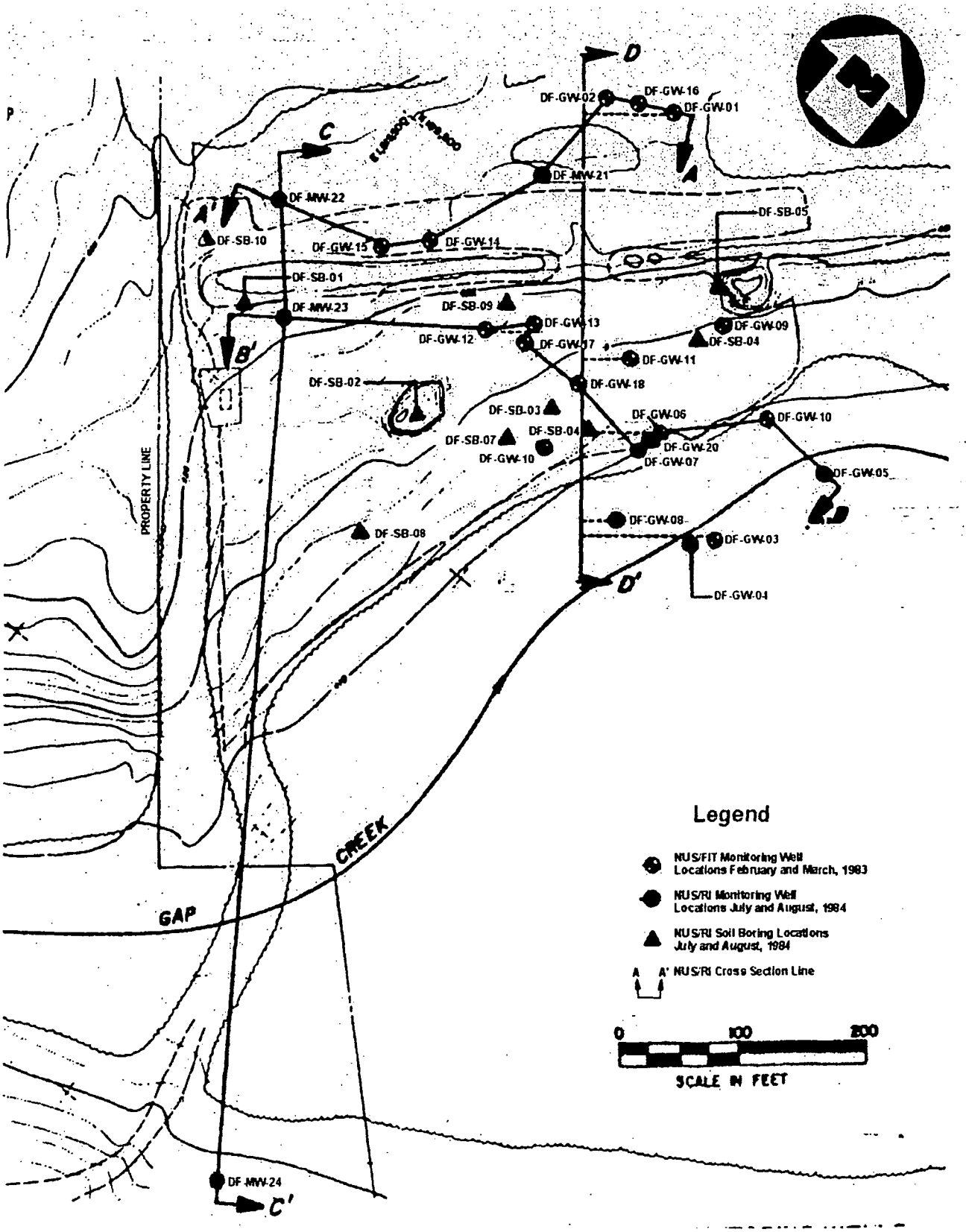

Figure 3-1. Soil and groundwater sampling locations for the RI.

Table 3-1. Results of July 1984 RI groundwater sampling.

Well	Screen Interval (ft bls)	COC (Health Based MCL in µg/l)									
		Arsenic (50)	Chromium (50)	Lead (50)	2- Butanone (170)*	Trans-1,2-Dichloro-ethene (70)	1,1,1-Trichloro-ethane (200)	Trichloro-ethylene (5)	Benzene (5)	Toluene (2000)	1,1-Dichloro-ethylene (7)
MW-1	68-78 (CGA)	ND	4	ND	-	ND	ND	ND	ND	ND	ND
MW-2	22 – 27 (FGA-2)	ND	**120**	41	-	ND	ND	ND	ND	ND	ND
MW-3	65-75 (CGA)	ND	7	18	-	ND	ND	ND	ND	ND	ND
MW-4	35-40 (CGA)	ND	17	6.1	-	ND	ND	ND	ND	ND	ND
MW-6	50-55 (CGA)	ND	5	15	-	ND	ND	ND	ND	ND	ND
MW-7	22 – 27 (FGA-2)	ND	8	ND	-	**780**	130	**6**	ND	24	**46**
MW-12	75-85 (CGA)	ND	9	22	-	ND	ND	ND	ND	ND	ND
MW-14	40-55 (CGA)	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
MW-15	22 – 27 (FGA-2)	ND	**98**	**55**	-	ND	ND	ND	ND	ND	ND
MW-16	7.5 - 12.5 (FGA-1)	ND	13	4.1	-	ND	ND	ND	ND	ND	ND
MW-17	13 – 18 (FGA-1)	ND	9	ND	-	ND	ND	ND	ND	ND	ND
MW-20	9 – 14 (FGA-1)	ND	43	19	-	**760**	**250**	**37**	ND	ND	**15**

Data compiled from NUS 1986.
Those concentrations in **BOLD** exceed Health Based MCLs.

* Data for this COC either not collected or unavailable
ND COC not detected during analysis (method detection limit [MDL] unknown)

Table 3-2. Results of September 1984 RI groundwater sampling.

Well	Screen Interval (ft bls)	COC (Health Based MCL in µg/l)									
		Arsenic (50)	Chromium (50)	Lead (50)	2-Butanone (170)*	trans-1,2-Dichloro-ethene (70)	1,1,1-Trichloro-ethane (200)	Trichloro-ethylene (5)	Benzene (5)	Toluene (2000)	1,1-Dichloro-ethylene (7)
MW-6	50-55 (CGA)	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
MW-10	26-31 (FGA-2)	ND	ND	6.9	-	ND	ND	ND	ND	2J	ND
MW-12	75-85 (CGA)	ND	ND	ND	-	ND	ND	ND	ND	3J	ND
MW-18	19-24 (FGA-2)	ND	ND	ND	-	5J	ND	ND	ND	ND	ND
MW-21	68-78 (CGA)	ND	ND	5.2	-	ND	ND	ND	ND	2J	ND
MW-22	57.2-67.2 (CGA)	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
MW-23	67.5-77.5 (CGA)	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
MW-24	65.4-75.4 (CGA)	ND	ND	ND	-	ND	ND	ND	ND	3J	ND

Data compiled from NUS 1986.
Those concentrations in **BOLD** exceed Health Based MCLs.

* Data for this COC either not collected or unavailable
ND COC not detected during analysis (MDL unknown)
J Estimated value

3.2 Post-ROD Groundwater Monitoring

This section describes post-ROD groundwater sampling activities for the groundwater storage tank, recovery wells, and MWs. Data for the groundwater storage tank were collected primarily per discharge permit requirements and to monitor the effectiveness of the remediation system. While these data do not enhance our understanding of Site conditions, they are presented in this report for completeness. In general, it appears that wells were not sampled on a consistent basis throughout the course of the LTRA. For instance, data from the recovery wells were spatially limited and did not span the duration of the LTRA. However, they are presented here also in the interest of completeness. Also, data from the MWs, although spatially limited (only a few wells were sampled consistently), are presented in this section and are then used to evaluate the effectiveness of the LTRA in Section 4.

3.2.1 Groundwater Storage Tank

Groundwater was extracted from the aquifer via recovery wells (see Figure 2-4). Following extraction, groundwater was stored temporarily onsite in the groundwater storage tank. Periodically, the water from the tank was sampled according to the discharge permitting requirements and transported offsite for disposal. The discharge permit application from the Metropolitan Sewer District for disposal of groundwater from the groundwater extraction system was completed based on results of the analysis of storage tank samples collected during operational testing in 1989 (Akindele 1993). None of the analytical data generated from this 1989 sampling were available for this report.

Subsequent sampling of the groundwater storage tank was performed periodically throughout the operation of the LTRA according to the discharge permit requirements to monitor the effectiveness of the groundwater remediation system. Results for February 1992 through June 1993 (see Appendix B, Table B-1 and Table 3-3) indicated that all COCs were below MCLs with the exception of TCE. Sampling of the tank between 1994 and 1997 indicated that the TCE concentration was nearing the MCL of 5 parts per billion (ppb) (Akindele 2001). Analytical data through May 2000 indicate that all COCs, with the exception of chromium, have been below MCLs since August 1997 (see Appendix B, Tables B-2 through B-11). Chromium levels have been below MCLs since February 2000. Again, the results collected from the storage tank do not provide information regarding contaminant distribution or support an evaluation of current conditions; they are simply presented in the interest of completeness.

3.2.2 Recovery Wells and Monitoring Wells

All data made available by EPA and the State of Kentucky are included in this report with the goal of compiling the most complete dataset possible to support the evaluation of the effectiveness of the LTRA on reducing contaminant concentrations at the Site. Unfortunately, the dataset is spatially restrictive and inconsistent (not all wells were sampled on a consistent basis). In general, it does not appear as though a consistent monitoring program was used at the Site over the years. For example, data collected from September 1992 through June 1995 were only available as ranges of highs and lows for each COC. Further, the specific sampling locations for these high and low data points are unknown. Subsequent to June 1995, data were only consistently presented for two of the 24 groundwater MWs (MW-17 and MW-19). This section includes all of the data available at the time of this report.

July 1987 sampling results of an unknown number of onsite groundwater MWs screened in the FGA indicated either similar results to past sampling events (those in 1984) or lower COC concentrations. A number of new unknown contaminants were identified at this time, which may have been due to improved detection limits of the laboratory instrumentation. Groundwater samples collected from MW-14, screened in the CGA, indicated no contamination (Dean 1987). MW-14 is located

approximately 40 ft northeast of MW-15 (see Figure 2-3). Neither the analytical data nor a list of the newly identified contaminants were available for this report.

Quarterly groundwater sampling of all recovery wells (RWs) and four MWs began in September 1992 (Akindele 1993). Samples were analyzed for total metals and cyanide, organic volatiles, and organic semi-volatiles. The frequency of groundwater monitoring activities was modified from quarterly to biannually in 1994 (Petitjean 1999). As stated above, analytical results for specific sampling locations were not available for September 1992 through June 1995. However, ranges of analytical results for this period are presented in Tables 3-3 and 3-4. These results indicate that by June 1995, arsenic, chromium, lead, 1,1,1-TCA, TCE and 1,1-DCE remained above MCLs for at least one location onsite; however, the locations of these exceedances are unknown.

Analytical results for groundwater samples collected at specific sampling locations (MWs and RWs) subsequent to July 1995 are presented in table form in Appendix B (Tables B-2 through B-11). Each table presents data for a specific COC from monitoring locations across the Site. The analytical data available for RWs (available through June 1998) indicate that all COCs were below MCLs at these locations.

Data are presented for samples collected from July 1996 through October 2000 from Wells MW-17 (screened in Unit 1 of the FGA) and MW-19 (screened in Unit 2 of the FGA) (see Figures 3-2 through 3-11). The purpose of these graphs is to illustrate COC concentration changes over time for a specific location. These wells were chosen to represent trends in contaminant concentrations at the Site because they had the most continuous series of monitoring data and because of their locations with respect to the contamination zones shown in Figure 2-3. Well MW-17 is located within the soil contamination zone and upgradient of the shallow groundwater contamination plume (see Figure 2-3). The soil contamination zone was delineated during the RI based on the location of previously buried waste and soil boring data. Because of its location, the results from MW-17 are used to assess the conditions in the contamination source area. MW-19 is located within the southern downgradient extent of the shallow groundwater contamination plume. Because of its location, the results from MW-19 are used to represent the concentrations of contaminants migrating downgradient from the source area. While the use of data from only two MWs does not present a comprehensive picture with respect to contaminant transport and distribution at the Site, these locations were the only wells with sufficient data to evaluate long-term trends over time. Additionally, because of their locations with respect to the contamination zones, data collected from these wells do offer information regarding changes in contaminant concentrations over time in both the source area and downgradient plume. Figures 3-2 through 3-11 were created using the following assumptions:

1. All non-detect values were plotted as ½ the value of the corresponding detection limit (ppb)

2. EPA data (as opposed to State of Kentucky data) were used for the October 16, 1998 sampling event

3. The highest concentration (most conservative value) reported for duplicate samples was used

4. All concentrations reported with data qualifiers were used. Data qualifiers are clarified in Appendix B.

Table 3-3. Results for quarterly groundwater monitoring, September 1992 through June 1993.

COC	Health Based MCL (µg/l)	September 23, 1992			December 16, 1992			June 16-17, 1993		
		MW	RW	Storage Tank	MW	RW	Storage Tank	MW	RW	Storage Tank
Arsenic	50	ND-77	ND-92	ND	ND-160	ND	ND	ND-42	ND	ND
Chromium	50	ND-37	ND	ND	ND-120	ND	ND	ND-25	ND	ND
Lead	50	ND-58	ND	86	10-52	ND	ND	10-31	ND-5	ND
2-Butanone	170	ND	ND	ND	ND	ND-1100	ND	ND	ND	ND_{250}*
Trans-1,2-dichloroethene	70	ND-33	ND-1700	110	ND-29	ND-3800	140	ND-33	ND-140	ND
1,1,1-Trichloroethane	200	ND	ND-1600	8	ND	ND-2600	48	ND-7	ND-46	33
Trichloroethylene	5	-	-	ND	3000J	ND-2900	46	ND-5	ND-20	14J
Benzene	5	-	-	ND	ND	ND	ND	ND-7	ND	ND_{25}*
Toluene	2000	ND	ND-2800	ND	ND	ND-4900	ND	ND	ND-26	ND
1,1-Dichloroethylene	7	ND_{10}*	ND_{10}*	ND_{10}*	ND_{10}*	ND_{10}*-87	ND_{10}*	5-ND_{300}*	ND_{10}*	ND_{25}*

Data compiled from Akindele 1993.
Those concentrations in **BOLD** exceed the Health Based MCLs.

ND_x Analyte not detected at concentration X in µg/l (majority were missing specific detection limits in report)
* Detection limit exceeds MCL
J Estimated value below MDL (MDLs not available in report)

Table 3-4. Results for biannual groundwater monitoring, June 1994 through December 1995.

COC	Health Based MCL (µg/l)	June 1994	Dec. 1994	June 1995
Arsenic	50	**170**	**130**	**150**
Chromium	50	**110**	**74**	**160**
Lead	50	**130**	42	**65**
2-Butanone	170	ND	ND	ND
Trans-1,2-dichloroethene	70	40	ND	ND
1,1,1-Trichloroethane	200	**500**	150	**220**
Trichloroethylene	5	**1200**	**45**	**14**
Benzene	5	**8**	**6**	ND
Toluene	2000	15	180	ND
1,1-Dichloroethylene	7	**180**	**21**	**22**

Data compiled from Petitjean 1999.

Those concentrations in **BOLD** exceed the Health Based MCLs.

ND Analyte not detected above MDL (MDLs not available)

Note: The concentrations reported in this table are the highest values reported for each COC taking into account both MWs and RWs

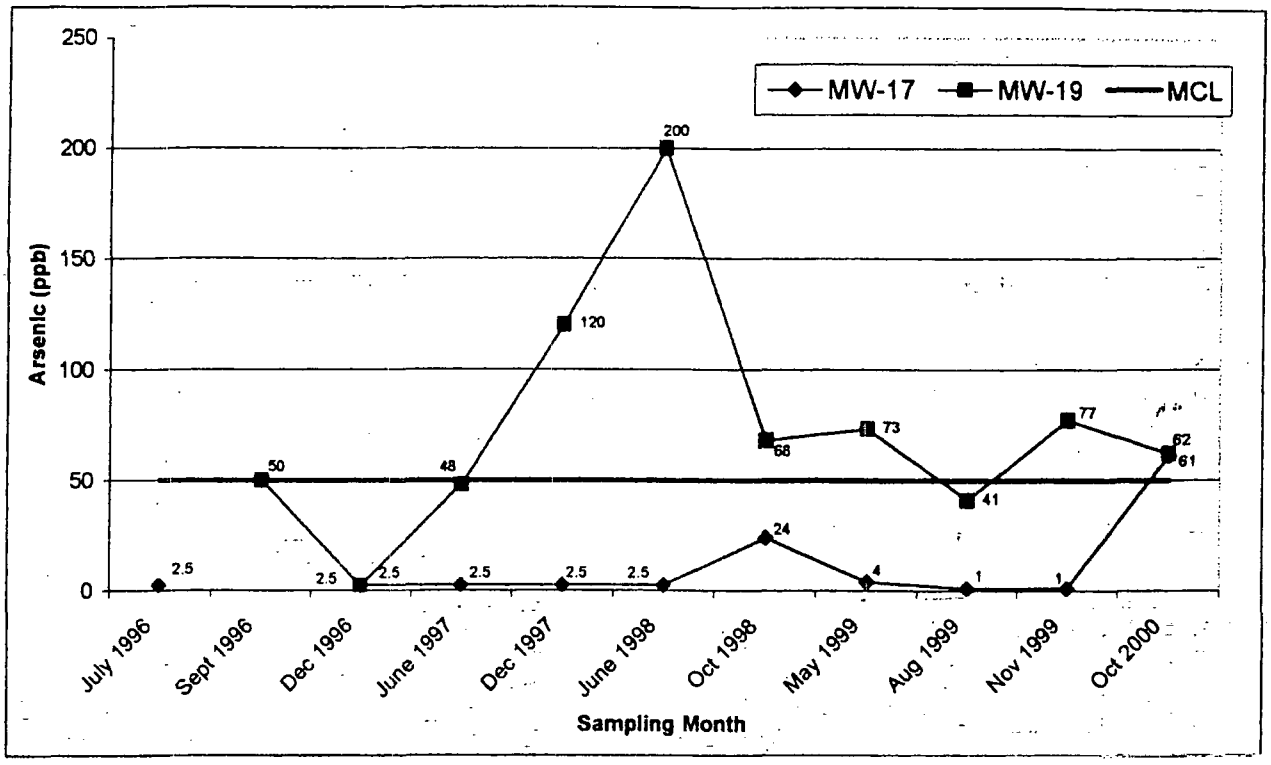

Figure 3-2. Arsenic concentrations over time, July 1996 through October 2000.

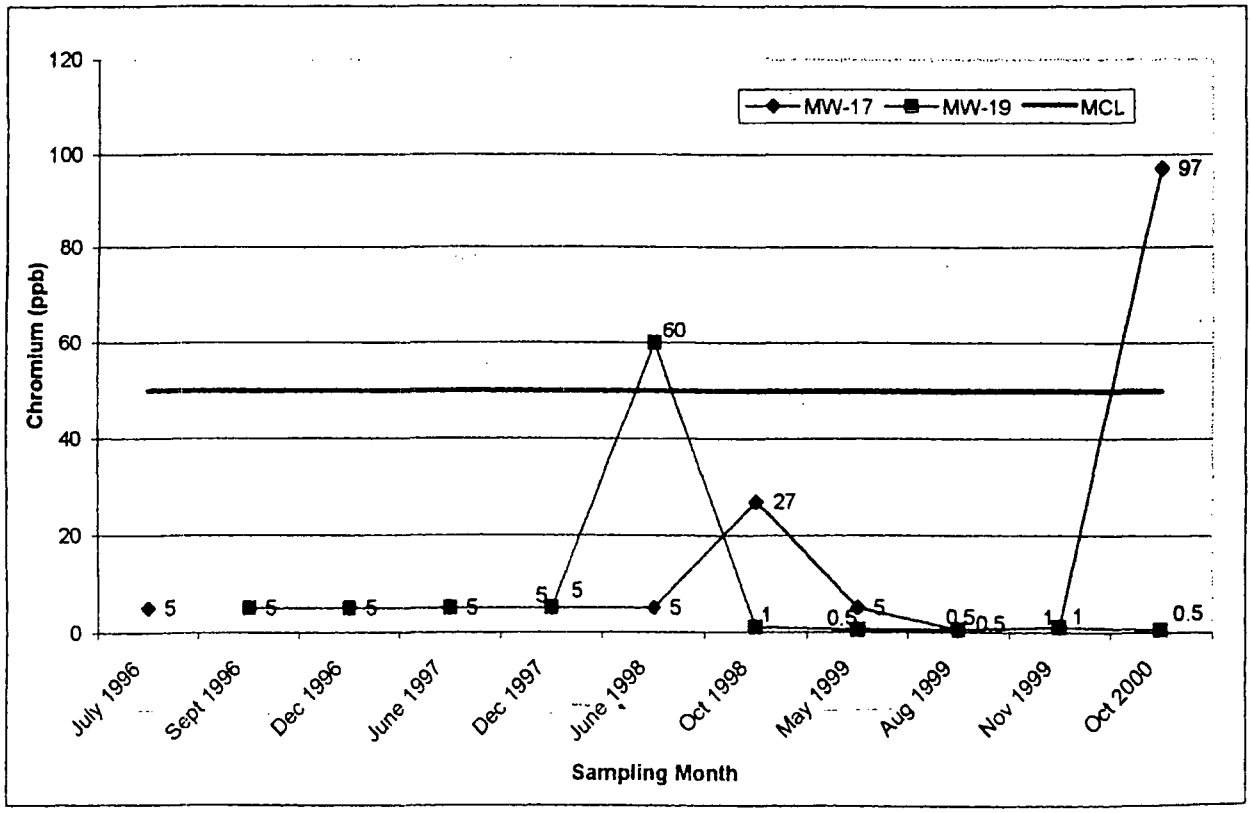

Figure 3-3. Chromium concentrations over time, July 1996 through October 2000.

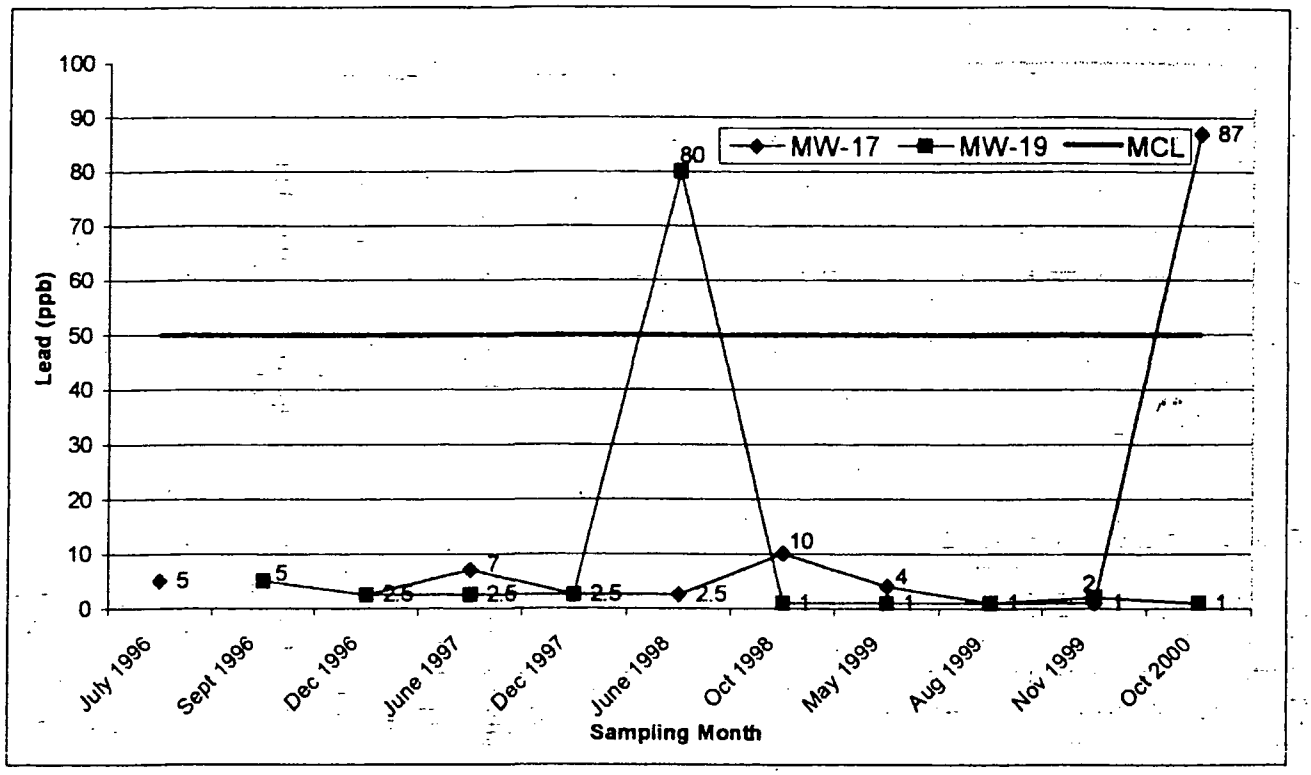

Figure 3-4. Lead concentrations over time, July 1996 through October 2000.

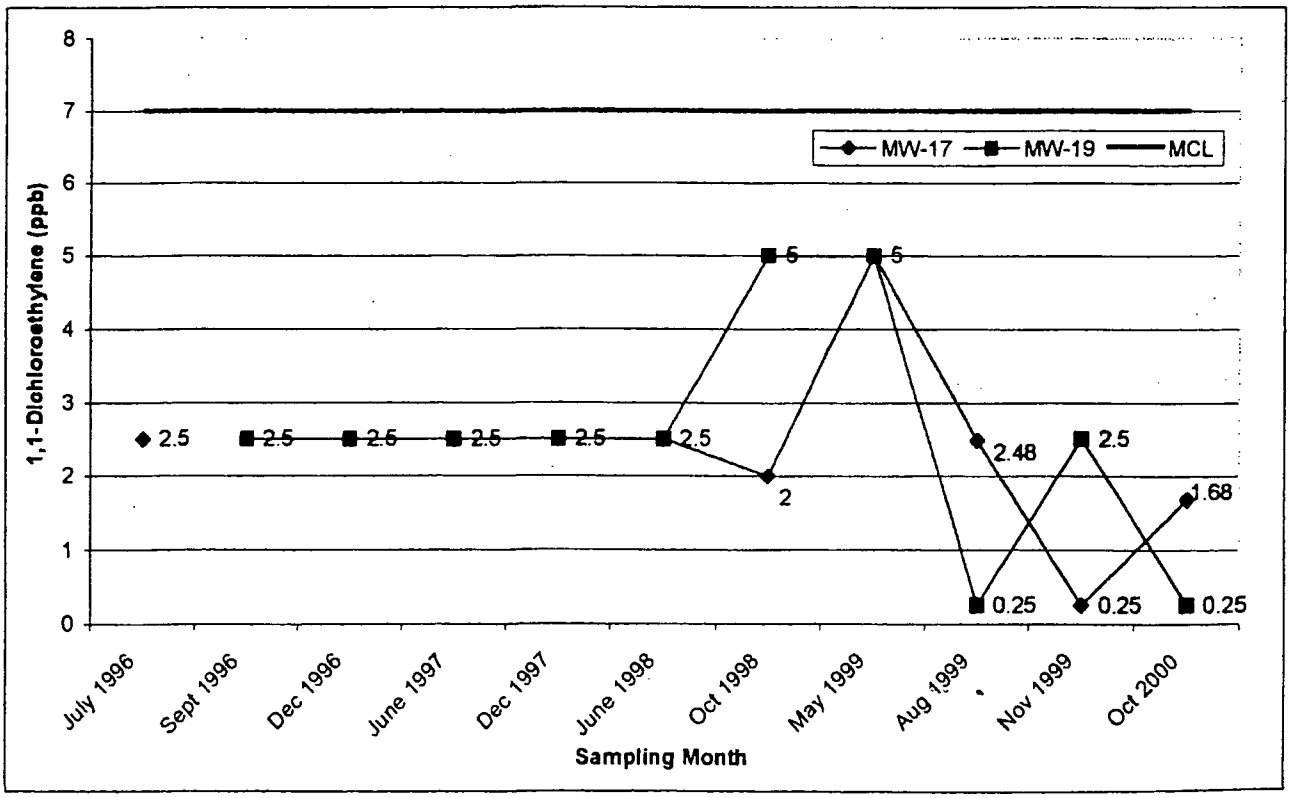

Figure 3-5. 1,1-DCE concentrations over time, July 1996 through October 2000.

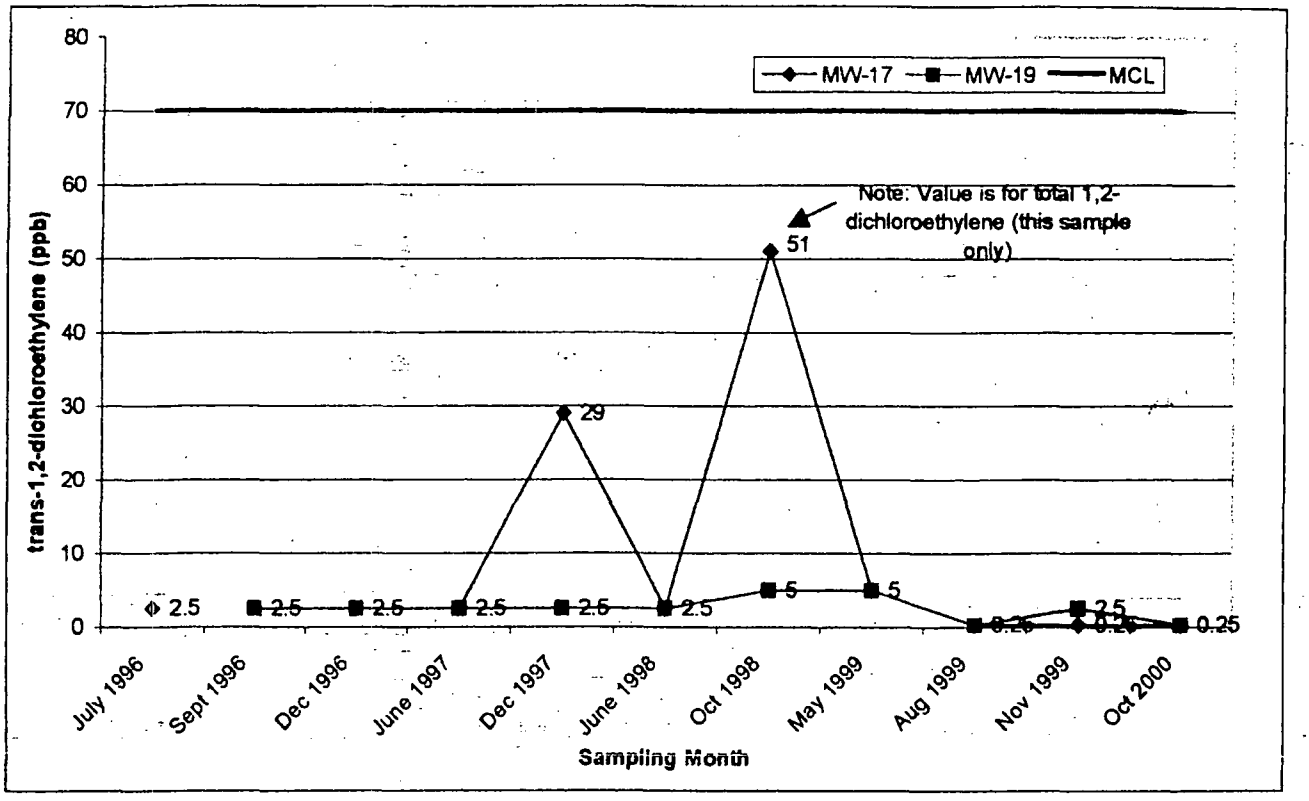

Figure 3-6. t-1,2-DCE concentrations over time, July 1996 through October 2000.

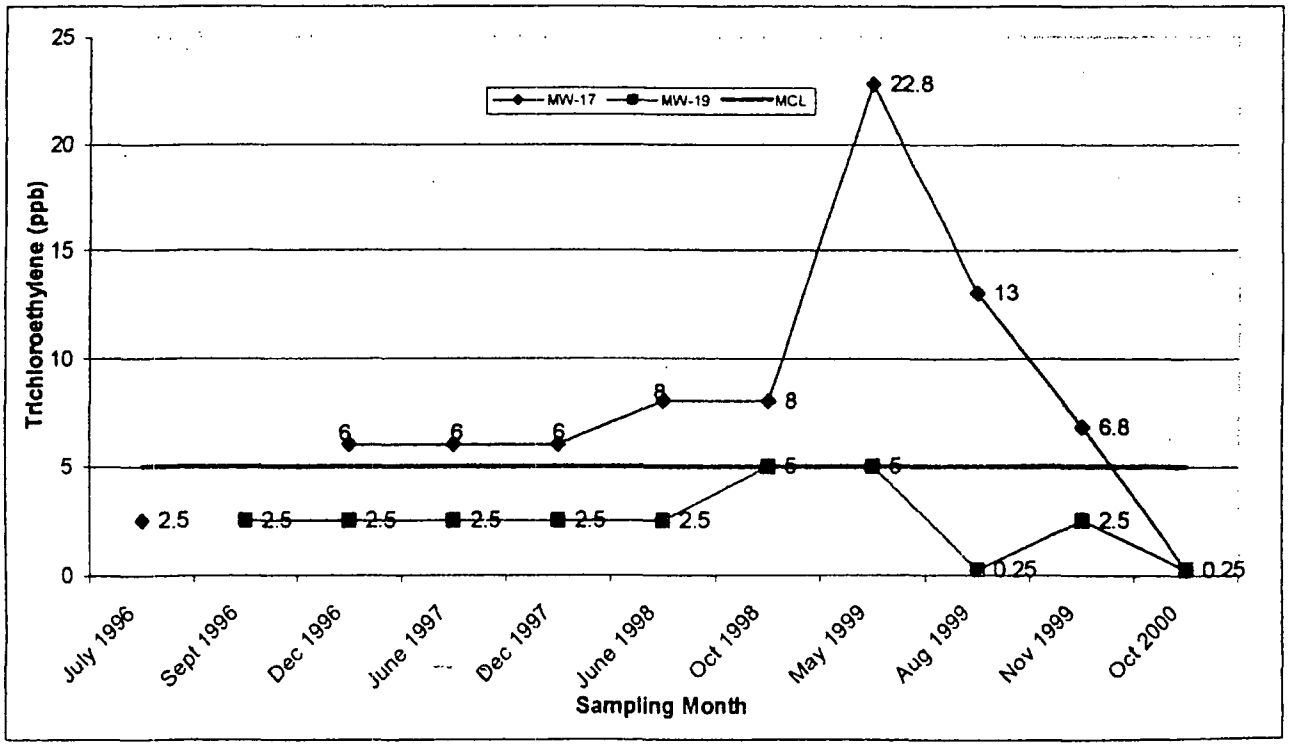

Figure 3-7. TCE concentrations over time, July 1996 through October 2000.

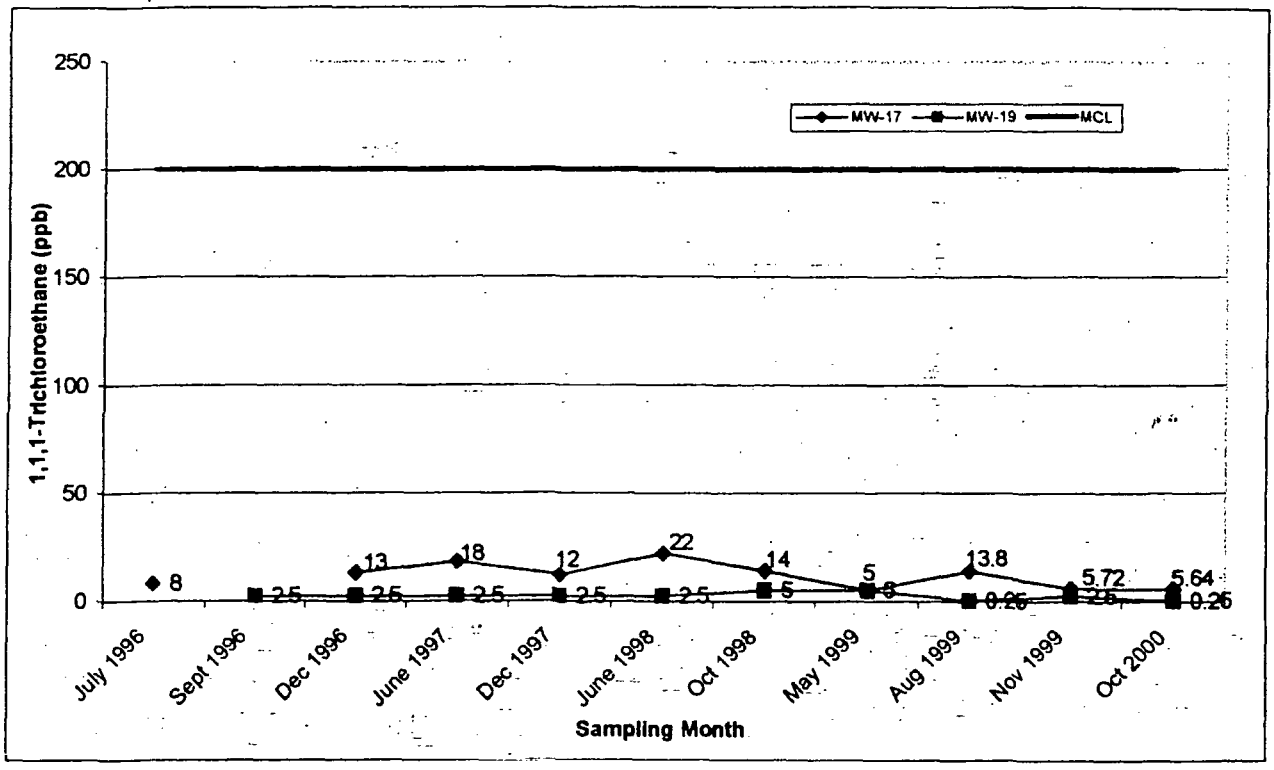

Figure 3-8. 1,1,1-TCA concentrations over time, July 1996 through October 2000.

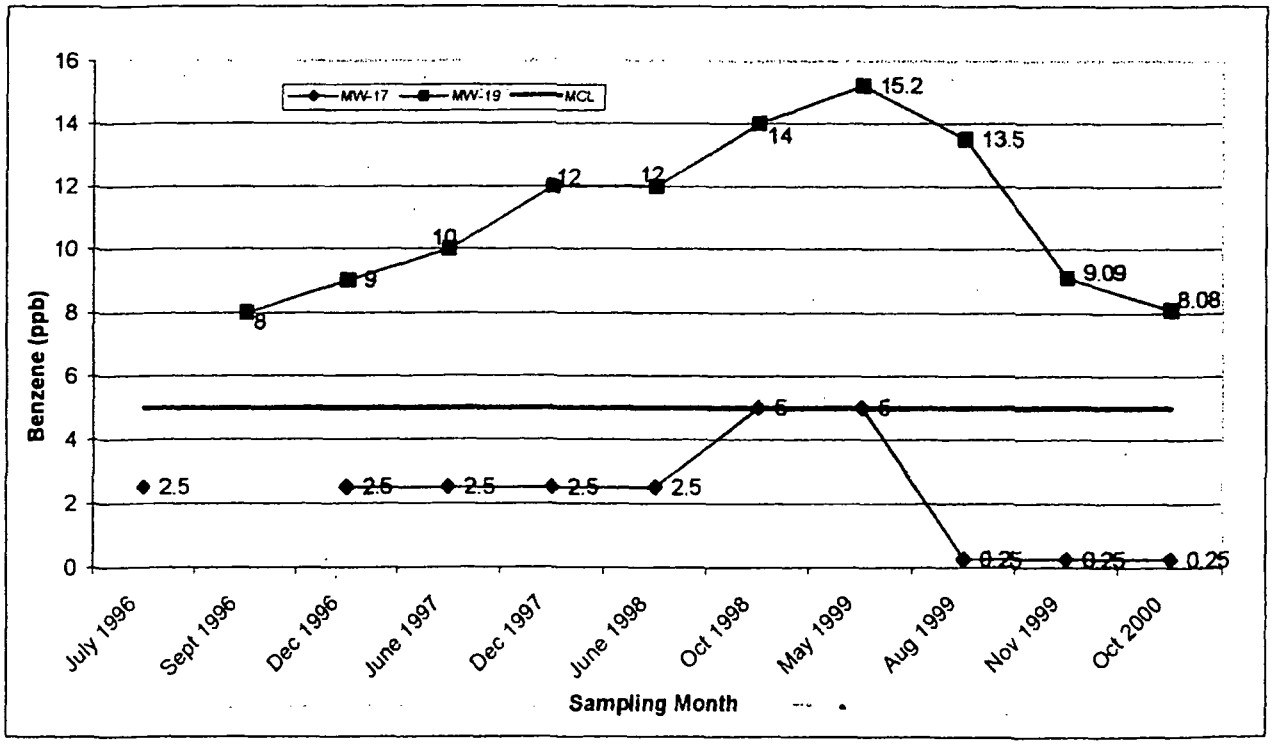

Figure 3-9. Benzene concentrations over time, July 1996 through October 2000.

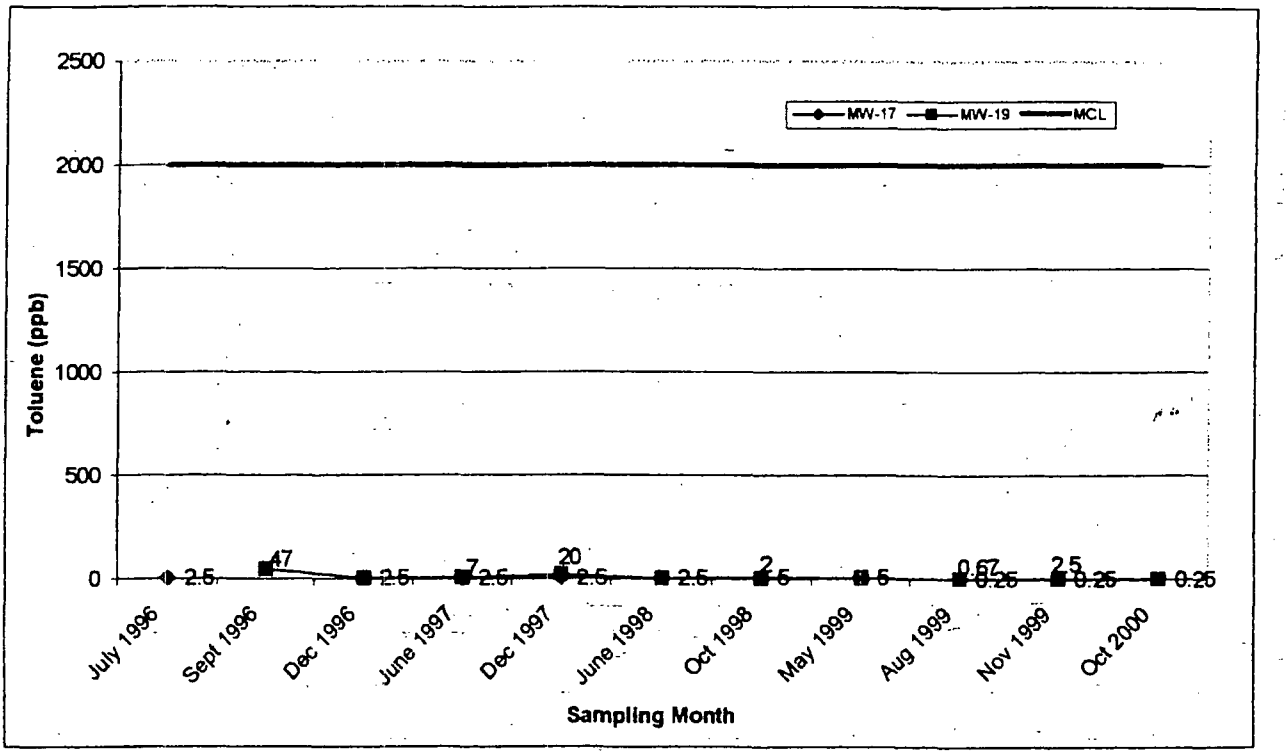

Figure 3-10. Toluene concentrations over time, July 1996 through October 2000.

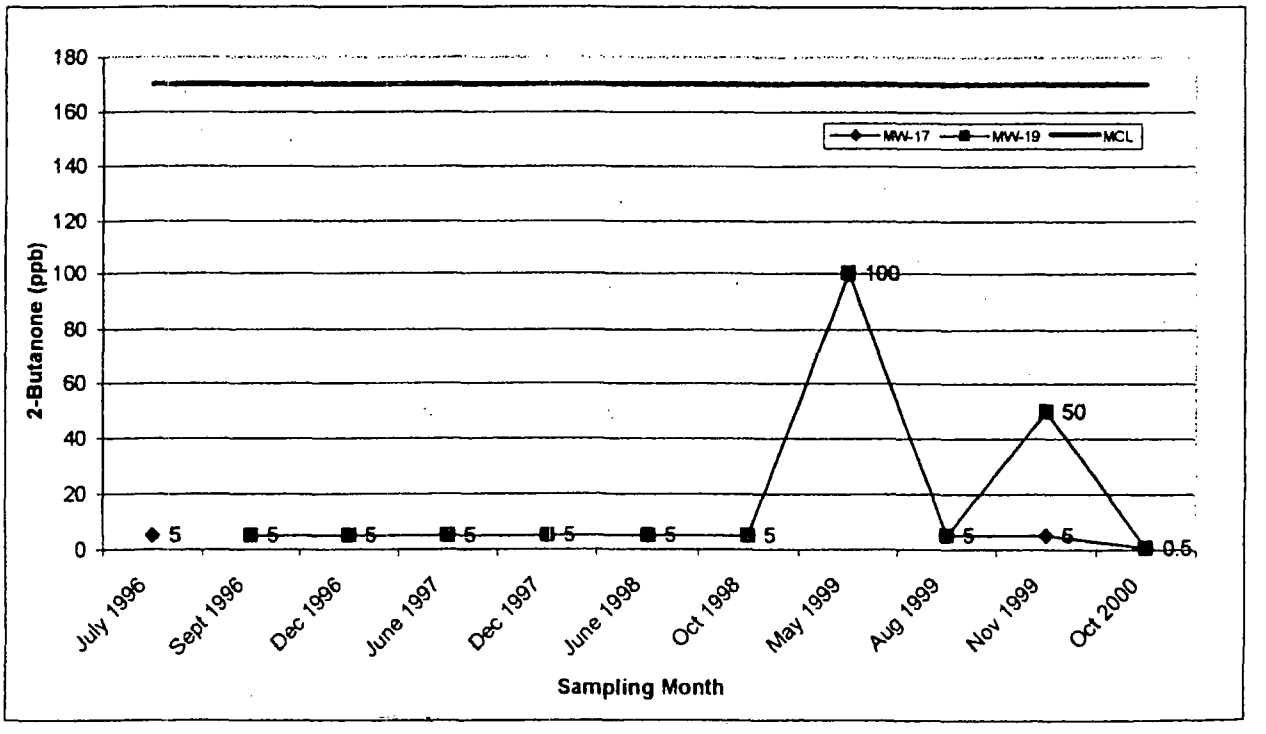

Figure 3-11. 2-Butanone concentrations over time, July 1996 through October 2000.

Figures 3-2 through 3-11 illustrate the trends in concentrations of COCs over time from 1996 to 2000. In the following text, data from wells MW-17 and MW-19 are used to represent conditions in the source area and downgradient contamination zone, respectively. For each COC, the concentrations are discussed in the context of the respective MCL for that contaminant. The following summarizes the trends shown in Figures 3-2 through 3-11.

Arsenic concentrations in the source area had been stable below the MCL since 1996; however, in October 2000, concentrations had increased to 61 ppb (see Figure 3-2). Downgradient, arsenic concentrations have decreased since June 1998 and have since been relatively stable at or near the MCL of 50 ppb. As of October 2000, arsenic in well MW-19 was 62 ppb, almost the same as that seen at MW-17 (see Figure 3-2). Chromium concentrations in the source area had been below the MCL of 50 ppb since 1996; however, in October 2000, had increased to 97 ppb (see Figure 3-3). Downgradient, chromium concentrations have been below the MCL of 50 ppb since October 1998 (see Figure 3-3). Lead concentrations in the source area had been below the MCL of 50 ppb; however, in October 2000, had increased to 87 ppb (see Figure 3-4). Lead concentrations in the downgradient groundwater contamination zone have been below the MCL of 50 ppb since July 1996, with the exception of a single data point (October 1998), which had a concentration of 80 ppb (see Figure 3-4).

1,1-DCE concentrations have consistently been below the MCL of 7 ppb in the source area and the downgradient groundwater contamination zone since July 1996 (see Figure 3-5). t-1,2-DCE concentrations have consistently been below the MCL of 70 ppb in the source area and the groundwater contamination zone since July 1996 (see Figure 3-6). The TCE concentration in the source area increased from 1996 to 1998 and have has shown a significant decrease (from 22.8 to < 0.5 ppb) since May 1999. As of October 2000, TCE was below the MCL of 5 ppb (see Figure 3-7). Downgradient, TCE concentrations have remained at or below the MCL since July 1996 (see Figure 3-7). 1,1,1-TCA concentrations have consistently been below the MCL of 200 ppb in the source area and the groundwater contamination zone since July 1996 (see Figure 3-8).

Benzene concentrations in the source area have been below the MCL of 5 ppb since August 1999 (see Figure 3-9). Downgradient, benzene levels increased from 1996 to 1999, and have decreased from 15.2 ppb in May 1999 to 8.08 ppb in October 2000. As of October 2000, benzene concentrations are slightly above (3.03 ppb) the MCL in the downgradient zone (see Figure 3-9). Toluene concentrations have consistently been below the MCL of 2,000 ppb in the source area and the downgradient groundwater contamination zone since July 1996 (see Figure 3-10). 2-Butanone concentrations have consistently been below the MCL of 170 ppb in the source area and the groundwater contamination zone since July 1996 (see Figure 3-11).

To summarize, concentrations of metals (i.e., arsenic, chromium, and lead) in the source area had been below MCLs since July 1996 but all showed an increase above MCLs in the most recent sampling round (October 2000). In the downgradient zone, only arsenic remains above the MCL (as of October 2000). Of the chlorinated volatiles (1,1-DCE, t-DCE, TCE, and 1,1,1-TCA), all are below MCLs in both the source area and downgradient zone as of October 2000. Finally, of the three remaining COCs, only benzene remains above the MCL (downgradient zone). This is summarized in Table 3-5, which presents the results from the most recent sampling event (October 2000). As of October 2000, arsenic, chromium, lead, and benzene were above MCLs, whereas 1,1-DCE, trans-1,2-DCE, 1,1,1-TCA, TCE, toluene, and 2-butanone were below MCLs.

Table 3-5. COC concentrations summary for Wells MW-17 and 19 from October 2000.

COC (µg/l)	Health Based MCL (µg/l)	MW-17 (µg/l)	MW-19 (µg/l)
Arsenic	50	**61**	**62**
Chromium	50	**97**	ND_1
Lead	50	**87**	ND_2
1,1-Dichloroethylene	7	1.68	$ND_{0.5}$
trans-1,2-Dichloroethene	70	$ND_{0.5}$	$ND_{0.5}$
Trichloroethylene	5	$ND_{0.5}$	$ND_{0.5}$
1,1,1-Trichloroethane	200	5.64	$ND_{0.5}$
Benzene	5	$ND_{0.5}$	**8.08**
Toluene	2000	$ND_{0.5}$	$ND_{0.5}$
2-Butanone	170	ND_1	ND_1

Those concentrations in **BOLD** exceed the Health Based MCLs
ND_x Analyte not detected at concentration X in µg/l

There was an additional monitoring event conducted following the October 2000 event in October 2001. During the October 2001 sampling event, two wells (MW-02 and MW-LH) were sampled. The results are presented in Table 3-6. MW-02 is located upgradient of the soil contamination zone and the shallow groundwater contamination plume identified during the RI investigation (see Figure 2-3). Because of its location, this well most likely represents background conditions, and therefore cannot be used to assess the effectiveness of the LTRA in reducing COC concentrations. It is unknown where MW-LH is located, and therefore the results from this well cannot be evaluated in the context of the distribution of contamination at the Site. Although the data likely represent background conditions (as shown in Table 3-6), no COCs above MCLs were identified at these locations.

Table 3-6. COC concentrations summary for Wells MW-2 and MW-LH from October 2001.

COC (µg/l)	Health Based MCL (µg/l)	MW-02 (µg/l)	MW-LH (µg/l)
Arsenic	50	25	8
Chromium	50	9	9
Lead	50	ND_2	ND_2
1,1-Dichloroethylene	7	$ND_{0.5}$	$ND_{0.5}$
trans-1,2-Dichloroethene	70	$ND_{0.5}$	$ND_{0.5}$
Trichloroethylene	5	$ND_{0.5}$	$ND_{0.5}$
1,1,1-Trichloroethane	200	$ND_{0.5}$	$ND_{0.5}$
Benzene	5	$ND_{0.5}$	$ND_{0.5}$
Toluene	2000	$ND_{0.5}$	$ND_{0.5}$
2-Butanone	170	ND_1	ND_1

Those concentrations in **BOLD** exceed the Health Based MCLs
ND_x Analyte not detected at concentration X in µg/l

4. DISCUSSION AND CONCLUSIONS

This section discusses the data presented in Section 3 in the context of evaluating the effectiveness of the LTRA in reducing contaminant concentrations to below MCLs at the Site. The completeness of the dataset (Section 4.1), the trends in COCs (Section 4.2), the absence of data from the CGA (Section 4.3), and finally conclusions, with respect to the evaluation of data in the context of the effectiveness of the LTRA, are presented (Section 4.4).

4.1 Completeness of the Dataset

This report is based on the analytical dataset made available by the EPA and the State of Kentucky. As discussed earlier in this report and summarized in Table 4-1, while data have been collected at the Site for a number of years, the sampling locations and frequency have not been consistent over this period of time. Specifically, not all of the wells were sampled on a regular frequency to produce a complete and consistent dataset. Therefore, there are gaps in the dataset (as shown in Table 4-1), making it a challenge to evaluate long-term COC concentration trends. The following summarizes the available dataset and what information can be gained from each phase of sampling.

4.1.1 September 1992 to June 1995

Quarterly groundwater monitoring of the LTRA began in September 1992. Data from September 1992 to June 1995 were available as ranges of high and low values across the Site; the specific sampling locations that produced these high and low values are unknown. Because of this, these data points cannot be used to understand the change in the distribution of contaminants over the Site, or to evaluate long-term COC trends at a specific location. However, the data can be used to determine whether or not clean-up goals are being met for each contaminant, in that if a COC was identified above MCLs during a particular sampling event, then it can be concluded that clean-up goals for that COC have not been met somewhere on the Site.

4.1.2 June 1995 to October 2000

After June 1995, data were available for specific sampling locations. However, of the 24 groundwater MWs installed during the RI investigation, only two wells (MW-17 and MW-19), both screened in the FGA, were sampled consistently throughout the operation of the LTRA. MW-17 is located within the soil contamination zone (contamination source), as identified in the RI Report. MW-19 is located along the southern downgradient edge of the groundwater contamination plume identified in the RI report. Because of their locations with respect to these contamination zones, it is reasonable to believe that these wells can be used to evaluate long-term COC concentration changes in the FGA, both within the source area (as represented by data from MW-17) and in the downgradient edge of the groundwater contamination zone (as represented by data from MW-19). Obviously, it would be desirable to have more data over a larger area of the site from which to assess the effectiveness of the LRTA, but this may be considered a reasonable approach for evaluating the change in contaminant concentrations in the FGA. These data are discussed in Section 4.2.

Table 4-1. Sampling matrix for monitoring activities from July 1984 through October 2001.

	MW-LH (?)	MW-01	MW-02	MW-03	MW-04	MW-06	MW-07	MW-10	MW-11	MW-12	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	MW-24	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
26-Jul-84	-	X	X	X	X	X	X	-	-	X	X	X	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
18-Sep-84	-	-	-	-	-	X	-	X	-	X	-	-	-	-	X	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-
11-Jul-96	-	-	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	Dry	X	Dry	X	Dry	X	X	X	-
19-Jul-96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	Dry	-	X	-	-	-	X
26-Jul-96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
13-Aug-96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
11-Sep-96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Dec-96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	-	-	-
5-Dec-96	-	-	-	-	-	-	-	-	X	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13-Dec-96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
12-Feb-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
5-May-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
4-Jun-97	-	-	-	-	-	-	-	-	X	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Jul-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
4-Aug-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X
27-Aug-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	X	-	-	-
15-Dec-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
30-Dec-97	-	-	-	-	-	-	-	-	X	-	-	-	-	X	-	X	-	-	-	-	-	Dry	X	X	-	Dry	X	Dry	X	-
8-Jun-98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	X	-	-	-
18-Jun-98	-	-	-	-	-	-	-	-	X	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-
17-Sep-98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
16-Oct-98 (KY)	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16-Oct-98 (EPA)	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11-May-99	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11-Aug-99	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9-Nov-99	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Feb-00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
4-May-00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
12-Oct-00	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16-Oct-01	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

X Sample Collected
- No Sample Collected
Dry Sample Collection attempted/Well was dry

4.1.3 CGA Monitoring

Contamination above MCLs was not identified in the CGA during the RI. Protecting the integrity of the CGA is the ultimate goal of the LTRA because it represents a pathway for off-site migration of contaminants and a potential risk to human health and the environment. However, no data were available from the CGA after the RI monitoring events. Therefore, it was not possible to assess the long-term COC concentration changes in the CGA, or to determine whether or not contamination from the FGA had migrated into the CGA.

4.2 Trends in COC Concentrations

Of interest to the evaluation of the LTRA and the need for additional remedial activities at the Site are the trends in the COC concentrations over time with respect to the MCLs. This section discusses the trends observed in COC concentrations at two monitoring locations, one located in the source area (MW-17) and one located in the downgradient groundwater contamination zone (MW-19), and provides possible explanations for the observed trends.

Trends indicate that concentrations of the metals (i.e., arsenic, lead, and chromium) have fluctuated since July 1996 (see Figures 3-2 through 3-4). In the source area (as represented by MW-17), arsenic, lead, and chromium concentrations were consistently below MCLs prior to the October 2000 sampling event. However, samples collected in October 2000 indicated increases in concentrations of all three metals to above MCLs (arsenic-61 ppb, chromium-97 ppb, lead-87 ppb). In the downgradient contamination zone (as represented by MW-19), similar fluctuations in metals concentrations were noted. Lead and chromium concentrations were below MCLs both prior to and following June 1998, but were above the respective MCLs for the June 1998 sampling event. Arsenic concentrations increased until June 1998 and have subsequently been stable since October 1998 to within +/- 20% of the MCL, although the October 2000 sampling event indicated a concentration above the MCL.

All remaining COCs, with the exception of benzene and TCE, have fluctuated but have been consistently below MCLs since July 1996 (see Figures 3-5 through 3-11). Benzene concentrations in the source area have been at or below the MCL since July 1996; however, in the downgradient contamination zone benzene concentrations have been above the MCL since September 1996. Concentrations increased from July 1996 until May 1999, and have subsequently decreased nearly 50% since May 1999 to 8.08 ppb, a few ppb above the MCL of 5 ppb. TCE concentrations have followed a similar trend; concentrations in the source area increased until May 1999, and subsequently decreased to below the MCL by October 2000. Concentrations of TCE in the downgradient contamination zone have been at or below the MCL since September 1996.

The assessment of current contaminant concentrations in Units 1 and 2 of the FGA is based on groundwater samples collected in October 2000 (see Table 3-5). Groundwater samples collected in October 2001, as shown in Table 3-6, are representative of background conditions only and therefore cannot be used to evaluate the effectiveness of the LTRA. As of October 2000, 1,1-DCE, t-1,2-DCE, TCE, 1,1,1-TCA, toluene, and 2-butanone were below MCLs in both the source area and downgradient contamination zones. Arsenic, chromium, and lead remained above MCLs in the source area, and arsenic and benzene remained above MCLs in the groundwater contamination plume downgradient of the source. Concentrations of the four COCs above MCLs at the Site are within two times the value of their respective MCLs. As discussed earlier in this report, no current (October 2000) data were available for the CGA.

As discussed previously, trends from July 1996 through October 2000 for wells MW-17 and MW-19 indicate that metal (i.e., arsenic, lead, and chromium) concentrations fluctuate within the FGA. These rises and falls in COC concentrations are evident in COC trend graphs of arsenic, chromium, and lead (see Figures 3-2 through 3-4). An increase in arsenic, chromium, and lead concentrations in MW-19 (screened in Unit 2 of the FGA in the groundwater contamination plume downgradient from the source) is seen in June 1998 followed by a marked decrease in concentration. Increases in arsenic, chromium, and lead concentrations in MW-17 (screened in Unit 1 of the FGA located within the soil contamination zone) are similarly noted in October 1998 and October 2000. The fact that all three species increase simultaneously (in June 1998 in MW-19 and in October 1998 and October 2000 in MW-17) suggests that a single mechanism is responsible for these fluctuations. The fluctuation of metal concentrations noted in both areas likely represents the collection and analysis of turbid samples. The "silting-up" of wells onsite has apparently been a problem over the years (Logsdon 2002). This "silting-up" of wells presents difficulties during well purging and sampling and can result in the collection of samples with high turbidity. This high turbidity can impact metals results, yielding higher concentrations than would be measured from a comparable non-turbid sample. It is likely that the June 1998, October 1998, and October 2000 sampling events represent turbid samples, which yielded relatively higher metals results.

Chromium and arsenic are redox-sensitive species and can be present in different forms depending on the geochemical conditions within the subsurface. These different forms have different mobilities; therefore, it is not unreasonable to expect that changes in the geochemical environment resulting from water level fluctuations could influence the dominant form, and thus the mobility, of these redox-sensitive metals. However, the trends that would be expected for arsenic and chromium, given their geochemical behavior, are not supported by the observed data. Specifically, the conditions that produce increased mobility of arsenic and chromium are opposite of each other, indicating that as the concentration of one goes up, the other should go down. However, the data show simultaneous increases in both metals in several sampling events. Therefore, it is not believed that water level changes are responsible for the fluctuations observed in the metals data, rather the more likely explanation is high sample turbidity, as described above.

Fluctuations were also observed in the concentrations of organic contaminants such as benzene and TCE. Both benzene and TCE concentrations in MW-19 increased until May 1999 and have since been gradually decreasing (see Figures 3-7 and 3-9). Seasonal fluctuations in water levels can affect the geochemical environment of the aquifer and influence the mobility of contaminants, causing contaminant concentrations to fluctuate. This effect has been observed at the Distler Brickyard Site, which is located within 1 mile of the Distler Farm Site, and is underlain by similar lithologic units (FGA and CGA) (Martin et al. 2000). Given the proximity of the two sites and the presence of similar hydrogeologic conditions, it is not unreasonable to expect that a similar process is operating at the Distler Farm. As at the Brickyard Site, the dominant controls on benzene and TCE migration in this system are likely sorption/desorption and biodegradation. These processes can be influenced by changes in water levels in that the influx of recharge will initially result in an increase in aqueous concentrations due to desorption; however, both benzene and TCE will show a decrease as biodegradative processes increase. While the rate and extent of biodegradation is dependent on the redox conditions, which can be influenced by increases in recharge, the mobility of organic contaminants is not directly redox sensitive (as are some metals). For this reason, the effect of changing water levels on organic contaminant concentrations will be relatively muted due to the combined effects of desorption (remobilization increasing the concentrations) and biodegradation (reducing the concentrations).

4.3 CGA Data Gap

The ultimate goal and purpose of the LTRA is to reduce potential risks to human health and the environment (NUS 1986). The major contaminant transport path potentially affecting human and environmental receptors is the movement of contaminated groundwater offsite. No offsite wells screened in the CGA were found to contain contamination due to offsite contaminant migration during the RI (NUS 1986). However, there were no data collected subsequent to the RI to indicate whether or not this continued to be the case. Moreover, there are no onsite monitoring data to indicate that the CGA remains free of contamination. Therefore, it is unknown whether the LTRA has been successful with respect to migration of contaminants into the CGA and subsequently offsite.

4.4 Conclusions

The following information summarizes the conclusions drawn from the available data, as presented in this report, with regard to the effectiveness of the LTRA at the Distler Farm Site.

- The available data allow for the evaluation of the effectiveness of the LTRA at a single location in the soil contamination zone (MW-17), and at a single location in the downgradient contamination zone (MW-19). Both of these locations are in the FGA.

- The results from MW-17 and MW-19 appear to indicate that the LTRA was effective in reducing or maintaining concentrations of 1,1-DCE, t-1,2-DCE, TCE, 1,1,1-TCA, toluene, and 2-butanone below MCLs. The results also appear to indicate that the LTRA has not been effective at reducing the concentrations of arsenic, chromium, lead, and benzene to below MCLs, as of the October 2000 sampling round.

- The fluctuations in some contaminant concentrations at values around the MCL may be related to sample turbidity issues and/or fluctuations in water levels.

- The data are not sufficient to evaluate the effectiveness of the LTRA at preventing migration of contaminants to the CGA.

5. TECHNICAL RECOMMENDATIONS

Based on the conclusions presented in the previous section, a quarterly monitoring plan is recommended to evaluate the COC concentrations in the FGA and the CGA to determine whether the Site is free of contamination above MCLs. This monitoring plan is recommended in order to support subsequent decisions at this Site regarding the need for additional remediation activities. Technical recommendations for this plan are as follows:

- It is recommended that quarterly sampling be performed for 2 consecutive years.
- It is recommended that groundwater monitoring be performed at four wells: two FGA wells (MW-17 and MW-19) and two CGA wells (MW-21 and MW-01). Monitoring at the FGA wells will allow for an evaluation of contaminant levels in the previously delineated contamination areas. Monitoring in the CGA wells will allow for an assessment of the groundwater leaving the site via the CGA. If for any reason MW-21 and MW-01 are not in adequate condition for groundwater sampling, comparable wells screened in the CGA can be substituted for quarterly monitoring.
- It is recommended that groundwater samples be analyzed for the COCs identified in the ROD (i.e., VOCs and metals).
- It is recommended that both filtered and non-filtered samples be collected for metals analysis to determine the potential impact of turbidity on the metals concentrations.

The performance of quarterly monitoring, as recommended here, will allow for (1) verification of levels of contaminants in the source area and the downgradient groundwater contamination plume in the FGA and (2) an evaluation of the levels of contaminants leaving the site via the CGA. The sampling proposed here will allow for the collection of data to assess the concentrations of contaminants and can be used to support a decision regarding the need for additional remedial activities at the Site.

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Appendix A

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Appendix B

Groundwater Monitoring Analytical Results, July 1996 through October 2000

Table B-1. Results for the groundwater storage tank sampling, February through March 1992.

COC (µg/l)	Health Based MCL (µg/l)	February 20, 1992	March 12, 1992	March 31, 1992
Arsenic	50	ND_{50}	ND_{50}	ND_5
Chromium	50	ND_{10}	ND_{10}	ND_{10}
Lead	50	ND_{100}*	ND_{100}*	ND_{100}*
2-Butanone	170	ND_{100}	ND_{100}	-
trans-1,2-Dichloroethene	70	ND_5	ND_5	ND_5
1,1,1-Trichloroethane	200	72	91	46
Trichloroethylene	5	**110**	**100**	**54**
Benzene	5	ND_5	ND_5	ND_5
Toluene	2000	ND_5	ND_5	ND_5
1,1-Dichloroethylene	7	ND_5	ND_5	ND_5

Data compiled from Akindele 1993.
Those concentrations in **BOLD** exceed the Health Based MCLs.

ND_x Analyte not detected at concentration X in µg/l
* Detection limit exceeds MCL

Table B-2. Arsenic concentrations, July 1996 to present (Health Based MCL = 50 ppb).

Sample Date	MW-LH	MW-02	MW-11	MW-17	MW-19	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
11-Jul-96			27	<5			<5		11		<5	<5	13	
19-Jul-96						<5		<5		<5				<5
13-Aug-96														5
11-Sep-96					**50**									
4-Dec-96						<5	<5	<5	<5	<5	<5			
5-Dec-96			9	<5	<5									
13-Dec-96													<5	
12-Feb-97														<5
5-May-97														<5
4-Jun-97			22	<5	48/ 39**									
2-Jul-97													15/16**	
4-Aug-97							<5							<5
27-Aug-97						<5	<5	<5			<5			
15-Dec-97														<5
30-Dec-97			23	<5	**120**		<5	<5			<5		24/11**	
8-Jun-98							<5	<5	<5		<5			
18-Jun-98			8	<5	**200**								10	
17-Sep-98														<5
16-Oct-98 (KY)				16	**55**									
16-Oct-98 (EPA)				24	**68**									
11-May-99				4	**73**									
11-Aug-99				<2	41									
9-Nov-99				<2	**77**									
2-Feb-00														2U
4-May-00														2
12-Oct-00				**61**	**62**									
16-Oct-01	8	25												

* Detection limits exceed MCL

** Duplicate Sampling

Conc. in **BOLD** exceed Health Based MCL

All conc. are in ppb

U – Material was analyzed for but not detected

The number is the minimum quantitation limit.

Table B-3. Chromium concentrations, July 1996 to present (Health Based MCL = 50 ppb).

	MW-LH	MW-02	MW-11	MW-17	MW-19	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
11-Jul-96			<10	<10			<10		30		<10	<10	<10	
19-Jul-96						<10		<10		<10				<10
13-Aug-96														<10
11-Sep-96					<10									
4-Dec-96						<10	<10	<10	<10	<10	<10			
5-Dec-96			<10	<10	<10									
13-Dec-96													<10	
12-Feb-97														<10
5-May-97														<10
4-Jun-97			<10	<10	<10/<10 **									
2-Jul-97													<10/<10 **	
4-Aug-97							<10							20
27-Aug-97						<10	<10	<10			10			
15-Dec-97														<10
30-Dec-97			<10	<10	<10		<10	<10			30		<10/<10 **	
8-Jun-98							40	<10	<10		20			
18-Jun-98			<10	<10	**60**								<10	
17-Sep-98														**1000**
16-Oct-98 (KY)				19	1									
16-Oct-98 (EPA)				27	<2									
11-May-99				5	<1									
11-Aug-99				<1	<1									
9-Nov-99				1	1									
2-Feb-00														2U
4-May-00														3
12-Oct-00				**97**	<1									
16-Oct-01	9	2												

* Detection limits exceed Health Based MCL
** Duplicate Sampling
Conc. in **BOLD** exceed Health Based MCL
All conc. are in ppb

U – Material was analyzed for but not detected
The number is the minimum quantitation limit

Table B-4. Lead concentrations, July 1996 to present (Health Based MCL = 50 ppb).

	MW-LH	MW-02	MW-11	MW-17	MW-19	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
11-Jul-96			<5	5			<5		9		<5	<5	11	
19-Jul-96						<50		<5		<5				<5
13-Aug-96														<5
11-Sep-96					5									
4-Dec-96						<5	<5	<5	<5	<5	<5			
5-Dec-96			<5	<5	<5									
13-Dec-96													<5	
12-Feb-97														12
5-May-97														12
4-Jun-97			<5	7	<5/<5									
2-Jul-97													11/10**	
4-Aug-97							<5							<5
27-Aug-97						<5	<5	<5			<5			
15-Dec-97														<5
30-Dec-97			<5	<5	<5		<5	<5			<5		<5/<5**	
8-Jun-98							<5	<5	<5		<5			
18-Jun-98			<5	<5	**80**								<5	
17-Sep-98														<5
16-Oct-98 (KY)				12	<2									
16-Oct-98 (EPA)				10	<2									
11-May-99				4	<2									
11-Aug-99				<2	<2									
9-Nov-99				<2	2									
2-Feb-00														2U
4-May-00														4
12-Oct-00				**87**	<2									
16-Oct-01	<2	<2												

* Quarterly Sampling
** Duplicate Sampling
Conc. in **BOLD** are above current MCLs
All conc. are in ppb

U – Material was analyzed for but not detected
The number is the minimum quantitation limit.

...y 1996 to present (Health Based MCL = 7 ppb).

	...W-02	MW-11	MW-17	MW-19	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
ul-96		<5	<5			<5		10		<5	<5	<5	
ul-96					<5				100				<5
ul-96							<5						
ug-96													<5
ep-96				<5									
c-96					<5	<5	<5	<5	16	<5			
c-96		<5	<5	<5									
ec-96												<5	
eb-97													<5
ay-97													<5
n-97		<5	<5	<5/<5**									
l-97												<5/<5**	
g-97						<5							<5
ug-97					<5	<5	<5			<5			
ec-97													<5
ec-97		<5	<5	<5		<5	<5			<5		<5/<5**	
n-98						<5	<5	<5		<5			
an-98		<5	<5	<5								<5	
ep-98													<5
98 (KY)			2.1	<50*									
8 (EPA)			2J	<10*									
ay-99			<10*	<10*									
ug-99			2.48	<0.5									
v-99			<0.5	<5									
-00													<5
-00													<0.5
-00			1.68	<0.5									
01	<0.5	<0.5											

n limit exceeds MCL
: Sampling
.D exceed Health Based MCL
n ppb

J – estimated value

Table B-6. trans-1,2-Dichloroethylene concentrations, July 1996 to present (Health Based MCL = 70 ppb).

	MW-LH	MW-02	MW-11	MW-17	MW-18	MW-19	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
11-Jul-96			<5	<5				<5		7		<5	<5	<5	
19-Jul-96							<5				24				<5
26-Jul-96									<5						
13-Aug-96															<5
11-Sep-96						<5									
4-Dec-96							<5	<5	<5	<5	<5	<5			
5-Dec-96			<5	<5		<5									
13-Dec-96														<5	
12-Feb-97															<5
5-May-97															<5
4-Jun-97			<5	<5		<5/<5**									
2-Jul-97														<5/<5**	
4-Aug-97								<5							<5
27-Aug-97							<5	<5	<5			<5			
15-Dec-97															<5
30-Dec-97			<5	29		<5		<5	<5			<5		<5/<5**	
8-Jun-98								<5	<5	<5		<5			
18-Jun-98			<5	<5		<5								<5	
17-Sep-98															<5
16-Oct-98 (KY)				<0.5		<50									
16-Oct-98 (EPA)				51 (Total 1,2 Dichloro-ethene)		<10 (Total 1,2 Dichloro-ethene)									
11-May-99				<10		<10									
11-Aug-99				<0.5		<0.5									
9-Nov-99				<0.5		<5									
2-Feb-00															<5
4-May-00															<0.5
12-Oct-00				<0.5		<0.5									
16-Oct-01	<0.5	<0.5													

* Detection limits exceed Health Based MCL
** Duplicate Sampling
Conc. in **BOLD** exceed Health Based MCL
All conc. are in ppb

Table B-7. Trichloroethene concentrations, July 1996 to present (Health Based MCL = 5 ppb).

	MW-LH	MW-02	MW-11	MW-17	MW-19	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
11-Jul-96			12	<5			<5		5		<5	<5	<5	
19-Jul-96						<5				867				<5
26-Jul-96								5						
13-Aug-96														28
11-Sep-96					<5									
4-Dec-96						<5	<5	<5	<5	53	<5			
5-Dec-96			<5	6	<5									
13-Dec-96													<5	
12-Feb-97														6
5-May-97														23
4-Jun-97			<5	6	<5/<5**									
2-Jul-97													<5/<5**	
4-Aug-97							<5							<5
27-Aug-97						<5	5	5			<5			
15-Dec-97														<5
30-Dec-97			<5	6	<5		<5	<5			<5		<5/<5**	
8-Jun-98							<5	<5	<5		<5			
18-Jun-98			<5	8	<5								<5	
17-Sep-98														<5
16-Oct-98 (KY)				7.94	<50*									
16-Oct-98 (EPA)				8J	<10*									
11-May-99				22.8	<10*									
11-Aug-99				13	<0.5									
9-Nov-99				6.8	<5									
2-Feb-00														<5
4-May-00														0.87
12-Oct-00				<0.5	<0.5									
16-Oct-01	<0.5	<0.5												

* Detection limits exceed Health Based MCL
** Duplicate Sampling
Conc. in **BOLD** exceed Health Based MCL
All conc. are in ppb

J – Estimated value

Table B-8. 1,1,1-Trichloroethane concentrations, July 1996 to present (Health Based MCL = 200 ppb).

	MW-LH	MW-02	MW-11	MW-17	MW-19	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
11-Jul-96			9	8			<5		85		<5	<5	<5	
19-Jul-96						<5				**1640**				<5
26-Jul-96								6						
13-Aug-96														62
11-Sep-96					<5									
4-Dec-96						<5	6	6	<5	200	<5			
5-Dec-96			<5	13	<5									
13-Dec-96													<5	
12-Feb-97														30
5-May-97														48
4-Jun-97			<5	18	<5/<5**									
2-Jul-97													<5/<5**	
4-Aug-97							13							<5
27-Aug-97						<5	13	<5			<5			
15-Dec-97														<5
30-Dec-97			<5	12	<5		<5	<5			<5		<5/<5**	
8-Jun-98							<5	<5	8		<5			
18-Jun-98			<5	22	<5								<5	
17-Sep-98														<5
16-Oct-98 (KY)				15.2	<50									
16-Oct-98 (EPA)				14	<10									
11-May-99				<10	<10									
11-Aug-99				13.8	<0.5									
9-Nov-99				5.72	<5									
2-Feb-00														7.3
4-May-00														3.33
12-Oct-00				5.64	<0.5									
16-Oct-01	<0.5	<0.5												

* Detection limits exceed Health Based MCL
** Duplicate Sampling
Conc. in **BOLD** exceed Health Based MCL
All conc. are in ppb

Table B-9. Benzene concentrations, July 1996 to present (Health Based MCL = 5 ppb).

	MW-LH	MW-02	MW-11	MW-17	MW-19	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
11-Jul-96			<5	<5			<5		<5		<5	<5	<5	
19-Jul-96						<5				8				<5
26-Jul-96								<5						
13-Aug-96														<5
11-Sep-96					8									
4-Dec-96						<5	<5	<5	<5	<5	<5			
5-Dec-96			<5	<5	9									
13-Dec-96													<5	
12-Feb-97														<5
5-May-97														<5
4-Jun-97			<5	<5	10/10**									
2-Jul-97													<5/<5**	
4-Aug-97							<5							<5
27-Aug-97						<5	<5	<5			<5			
15-Dec-97														<5
30-Dec-97			<5	<5	12		<5	<5			<5		<5/<5**	
8-Jun-98							<5	<5	<5		<5			
18-Jun-98			<5	<5	12								<5	
17-Sep-98														<5
16-Oct-98 (KY)				<0.5	<50*									
16-Oct-98 (EPA)				<10*	14									
11-May-99				<10*	15.2									
11-Aug-99				<0.5	13.5									
9-Nov-99				<0.5	9.09									
2-Feb-00														<5
4-May-00														<0.5
12-Oct-00				<0.5	8.08									
16-Oct-01	<0.5	<0.5												

* *Detection limits exceed Health Based MCL*

** Duplicate Sampling

Conc. in **BOLD** exceed Health Based MCL

All conc. are in ppb

Table B-10. Toluene concentrations, July 1996 to present (Health Based MCL = 2,000 ppb).

	MW-LH	MW-02	MW-11	MW-17	MW-19	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
11-Jul-96			<5	<5			<5		15		<5	<5	<5	
19-Jul-96						<5				4250				<5
26-Jul-96								<5						
13-Aug-96														<5
11-Sep-96					47									
4-Dec-96						<5	<5	<5	<5	22	<5			
5-Dec-96			<5	<5	<5									
13-Dec-96													<5	
12-Feb-97														<5
5-May-97														<5
4-Jun-97			<5	<5	7									
2-Jul-97													<5/<5 **	
4-Aug-97							<5							<5
27-Aug-97						<5	<5	<5			<5			
15-Dec-97														<5
30-Dec-97			<5	<5	20		<5	<5			<5		<5/<5 **	
8-Jun-98							<5	<5	<5		<5			
18-Jun-98			<5	<5	<5								<5	
17-Sep-98														<5
16-Oct-98 (KY)				<0.5	<50									
16-Oct-98 (EPA)				<10	2J									
11-May-99				<10	<10									
11-Aug-99				<0.5	0.67									
9-Nov-99				<0.5	<5									
2-Feb-00														<5
4-May-00														<0.5
12-Oct-00				<0.5	<0.5									
16-Oct-01	<0.5	<0.5												

* Detection limits exceed Health Based MCL

** Duplicate Sampling

Conc. in **BOLD** exceed Health Based MCL

All conc. are in ppb

J – Estimated Value

Table B-11. 2-Butanone concentrations, July 1996 to present (Health Based MCL = 170 ppb).

	MW-LH	MW-02	MW-11	MW-17	MW-19	RW-1	RW-2	RW-3	RW-4	RW-5	RW-6	RW-7	UDF-02	Storage Tank
11-Jul-96			<10	<10			<10		<10		<10	<10	<10	
19-Jul-96						<10				1020				<10
26-Jul-96								<10						
13-Aug-96														
11-Sep-96					<10									
4-Dec-96						<10	<10	<10	<10	<10	<10			
5-Dec-96			<10	<10	<10									
13-Dec-96													<10	
12-Feb-97														<10
5-May-97														<10
4-Jun-97			<10	<10	<10/<10**									
2-Jul-97													<10/<10**	
4-Aug-97							<10							<10
27-Aug-97						<10	<10	<10			<10			
15-Dec-97														<10
30-Dec-97			<10	<10	<10		<10	<10			<10		<10/<10**	
8-Jun-98							<10	<10	<10		<10			
18-Jun-98			<10	<10	<10								<10	
17-Sep-98														<10
16-Oct-98 (KY)				<10	<1000*									
16-Oct-98 (EPA)				<10	<10									
11-May-99				<200*	<200*									
11-Aug-99				<10	<10									
9-Nov-99				<10	<100									
2-Feb-00														<5
4-May-00														<1
12-Oct-00				<1	<1									
16-Oct-01	<1	<1												

* Detection limits exceed Health Based MCL
** Duplicate Sampling
Conc. in **BOLD** exceed Health Based MCL
All conc. are in ppb